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Address of the President (Mr. W. F. Barrett) of the Illinois Gas Association, Tenth Annual Meeting, Chicago, March, 1914.

Gentlemen: It has been the custom at each convention for the President to bring before the members a report on the progress of and important developments in the various fields of the gas industry, and to comment upon the activities and needs of the Illinois Gas Association. I feel very poorly qualified to comply with either of these established practices.

About 6 months ago I entered a new field of work, although I still maintain a Chicago office, but the greater part of my time is of necessity spent in the East. I discussed, with several members of the Association, the question of tendering my resignation, but they were unanimous in saying that, from an Association standpoint, the resignation of the President in the middle of his term of office was inadvisable. I was further assured by these gentlemen that they would not allow the interests of the Association to suffer from my absence, and I am glad to say that, due to their efforts and yours, the Association has progressed and prospered during the year.

Unquestionably the most important development of the year for the Illinois gas man has been the creating of a Public Service Commission. As the formation of the Commission is so recent, and as I have been in touch so intermittently with Illinois matters, any remarks I may make on this subject would necessarily be inadequate.

The uses of gas in the industrial field continue to multiply, and it would seem that this branch of the industry offers the solution of many of the perplexing problems confronting gas companies. Much has been written on this subject descriptive of the new uses and the new appliances, and to my mind the vital consideration has, if not entirely overlooked, been at least not sufficiently emphasized. This consideration is the necessity for the gas engineer of to-day, however skilled he may be in manufacture, construction and distribution, to immediately broaden his field and to include in gas engineering, scientific industrial engineering, to develop the industrial uses of his product. Too many commercial and sales' managers are required to step outside the boundaries of salesmanship and design appliances which are or should be engineering problems. The gas engineer owes it to himself, and to his profession, to include this work in his present well recognized scope.

I wish further to suggest to this Association that it earnestly consider the advisability of urging a consolidation of the American Gas Institute and of the National Commercial Gas Association, with the ultimate idea of the various State Associations becoming local sections of the combined organization. The majority of us are members of at least 3 or 4 associations, and we cannot have failed to note at the conventions, and in the proceedings of these associations, that their work overlaps. Research work, papers, committees, etc., are constantly being duplicated, and an enormous amount of mental energy is being practically wasted, solely from lack of proper organization. By consolidating much of this energy would be properly and efficiently directed, and all gas men would be systematically working in unison for the improvement and growth of the industry. That such an organization is practical is shown by the great success obtained in England by a unified Association, and by the highly efficient work accomplished by such organizations as the American Society of Civil Enginers, the American Society of Mechanical Engineers, etc. The advantages of such a powerful, far-reaching association, both to the industry and to the individual member, are too many to name. If the members of this Association care to discuss this matter, I think the occasion opportune. The consolidation, in my opinion, will undoubtedly be effected in time, and if the Illinois Gas Association could be instrumental in facilitating it, I feel that the Association would again be demonstrating the progressive spirit that has always characterized it.

In conclusion, I wish to welcome all the members and guests to this, the Tenth Annual Convention of the Illinois Gas Association, and to thank the officers, committees and members for their splendid co-operation during the year.

[Continued from page 183.]

The Installation of Cast Iron Mains.[1]

[Prepared for the Eighth Annual Meeting, American Gas Institute, 1913, by WALTON FORSTALL.]

TESTING JOINTS.

The ordinary small, low pressure main needs no test for tightness prior to refilling, save with soap suds under gas pressure. The suds are applied with a shaving brush, over the face of the joint and the adjacent spigot and bell, and a leak will be indicated by bubbles. There will be times when it is advisable to refill as soon as the joint is made, omitting testing, as for instance, if the trench cannot be kept open or when cement is used and temperature conditions are

1. Slightly abridged.—EDS.

hard to maintain. In New York the success with lead wool joints has been so great that no test is made on them.

When the main is laid by contract, or if it is larger than 12″, it is good practice to test with 3 to 5 pounds air pressure and soap suds. If possible, the test should be made when the range of air temperature is small, for in a large main there might be a stationary or slightly raising pressure, even when there are a few large leaks. Where the length of line under pressure does not exceed 1,000 feet, the gauge is more independent of temperature, but at the same time temperature must always be borne in mind, as it is possible with falling temperature, to have a falling gauge on a perfectly tight line. When the fall in pressure cannot be accounted for by temperature conditions and every joint shows tight, a search should be made for a cracked pipe.

For any volume up to 2,000 feet of 30″ pipe, the air pump, Fig. 16

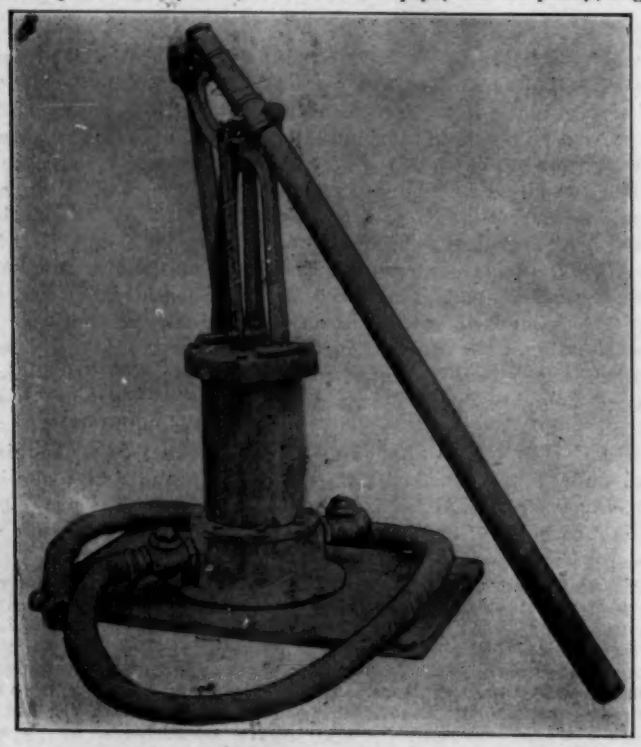

Fig. 16.—Air Pump.

is sufficiently large. For a larger volume, a steam driven pump might be used to advantage. Outfits are obtainable in which boiler and pump are mounted on a wagon frame and easily drawn from place to place.

We usually test as near 7 A.M. as possible. The night before, all openings in the main are plugged up, the air pump is attached and the mercury gauge examined and made ready. For attaching the pump, a 1¼″ hole is tapped in the main or preferably, in the closing plug or cap, 1¼″ pipe with a ¾″ connection for the gauge, is used, and armored hose connects the pipe to the pump. With this pump for a pressure of 3 pounds in 500 feet of 30″, four men would start pumping 2 hours before 7 A.M. The test is made by 2 men with brushes and a bucket of ivory soap suds, a foreman supervising the work and marking any leaks found. When the test is completed, the pressure should be relieved through the standpipe before removing the closing plug or cap to avoid danger of injury to the workmen.

Precautions Against Settlement.—After a line is tight and properly covered, the reasons for breaks or leaky joints are subsequent exposure of the pipe, stresses due to street traffic and to temperature, and settlement of the pipe. The first must be guarded against by efficient line walking, the second and third are effected by the depth of the pipe, and the fourth will be considered now.

Supposing the trench is in firm ground, the theory used to be that the pipe should be laid on this firm trench bottom, excavation being made for each bell. This was all right where obstructions were few, and no occasion arose to decrease the expected cover after the trench was bottomed; and if the gang was small and had one or more laborers skilled in making a bottom in one plane, not formed of a series of short planes. But these conditions were never obtainable in towns of any size, and usually the result of laying directly on the earth was a line supported at a series of points along each length, and resting on refilled earth where the original trench depth was too great. Trouble frequently resulted from such conditions, and, of course, more often with large pipe. Without any earth compression, the support of a length is a line about 11 feet long. If, as usual, the pipe was allowed to drop on its bed several times, *assuming* it always fell in the same place, there would be a concave bed probably several inches wide. Actually, however, it is impossible to get any greater bed than by one dropping, and if this did not leave the pipe in a straight line with that already laid, a crook must be left in the line or the bed disturbed. The use of blocking obviates these difficulties. The trench need not be carefully bottomed except where the blocking rests. In setting the block a paving rammer should be used to ensure that it has a firm bearing over its whole area, or another good way is to raise the bell end of pipe about 2 feet, and allow it to fall free on the block. The pipe can now be moved sideways on the block, or up and down by inserting distance pieces and wedges, with the certainty that its stability is not affected. Wedges and distance pieces of 1″ board enable an exact alignment as to height, something impossible to obtain when laying on the trench bottom.

Schedule of Blocking.

Size of Mains.	Size of Blocking.			Size of Distance Pieces.			Size of Wedges.		
	Thickness.	Width.	Length.	Thickness.	Width.	Length.	Thickness.	Width.	Length.
3″ to 8″	3″	12″	12″	1″	12″	12″	1½″	4″	6″
10″ to 12″	3″	12″	18″	1″	12″	12″	2″	5″	8″
16″ to 20″	3″	12″	24″	1″	12″	24″	3″	5″	12″
24″ to 30″	4″	12″	30″	1″	12″	24″	3″	5″	12″

For services use 2″ x 8″—8″.

The blocking must be of full width and placed upon undisturbed earth. For mains over 16″, two blocks are laid side by side at each blocking point, making the width of 4 blocks for each length.

This schedule may be considered by some as too liberal, but it was designed with the knowledge that a few leaks under asphalt would pay for many feet of lumber. Two-inch blocks could be used for small pipe, but 3″ will last longer, and the extra thickness may some day prevent settlement, where a block has been improperly imbedded. The blocks are short and wide rather than long and narrow, because the more nearly square it is, the more apt is it to bear on its whole surface. A block almost as long as the trench is wide will often rest on earth only at its ends.

The surface area of the blocking as given, causes a pressure per square inch of bearing surface of the blocking on the trench, varying from 32 pounds for the 8″, to 10 pounds for the 24″, the weight taken being that of a pipe and a paral lel-opipedon of earth, 3 feet high, 12 feet long and of width equal to the outside diameter of the pipe. For pipe over 8″, there are two blocking places in each length, giving a positive support to the spigot end, which is of great advantage in making cement joints, as it enables less yarn and more cement to be used and prevents a settlement of the spigot. Where more blocking area is needed 4 blocks are used, two at each blocking place; 3″ x 12″ lumber is used for all blocking, the only difference between blocks being in their length, and these are so arranged that some of the larger blocks can be cut to make two smaller.

There is only one objection to the use of blocking, the space left between the main and the trench bottom. Refilling this space will be considered later. Care in setting the blocking in the trench bottom will reduce the space to less than one inch, and this care should be taken.

Where the soil is of uncertain stability, or the weight exceptional, special methods might be used. Short piles may be driven into the trench bottom at each side and the blocking rest on them. Concrete or brick piers may be built, and are often advisable under specials, particularly bends used where the main changes in cover, and a big pile of blocking would be required. In every case, however, the pipe should rest on wood and not on the pier direct.

Necessity for Bagging.—No matter how small the pipe, no connection should be made either by a cut-out or by removing a plug or cap, without first stopping off the gas. There are many workmen and some foremen who object to this precaution in small mains, but such practice should not be tolerated, as it involves too much risk to the workmen, and also to the maintenance of gas supply. In the old days of small mains, animal bladders served very well, until the advent of rubber bags, which in turn have been largely supplanted by stoppers.

The larger the main, the more danger from unrestricted flow, and, therefore, more care is necessary in stopping off this flow. In Philadelphia, one bag or stopper is used in mains 8″ and smaller, and 2

bags, or 2 stoppers, or one bag and one stopper, for larger mains; the last combination preferred, especially for very large mains, where the stopper is not apt to fit close enough. Ordinarily, a separate hole is tapped for each bag or stopper, and the latter is placed farthest from the opening, that is towards the gas flow, and takes up the pressure, so that the bag simply stops what little gas may be going past the stopper. This on the assumption that a wrought iron "bleeder" pipe is inserted in the bag hole, to carry well above the top of the trench, any gas leaking past the stopper. If no bleeder is used the bag stands the full pressure, but the stopper is the safeguard against any great gas flow, in case the bag breaks.

Size of Bag Holes.—Our schedule of holes for bags and stoppers, is as follows:

Size of Main.	Hole for Bag.	Hole for Stopper.
3″	1″	1″
4″	1″	1¼″
6″	1½″	1½″
8″	2″	2″
10″	2″	2″
12″	2½″	2½″
16″	*3″	3″
20″	*3″	3″
24″	4″	4″
30″	4″	4″
36″	4″	4″

* Four inch will be needed for the heavy canvass bags.

Insertion and Withdrawal.—After the hole has been drilled, the portion of the main where the bag will rest, is carefully cleaned of metal cuttings, and any condensation, the latter often having a very rapid action in dissolving rubber; the cleaning is done by waste or cloth on the end of a stick. Where condensation is encountered it is well to protect the bag by soaping it, and this will also help in making a bag hold back gas where the inside of a main is rough. If it is thought desirable to use a bag saving device, this is now screwed on.

The bag fork, *I* (Fig. 10) is sometimes used in inserting the bag. The bag is folded on the face of the fork, and the stem pulled back between the prongs near the hilt. The bag and fork are then entered, the fork serving to force the bag down into the main and away from the hole. After inflating the bag, the fork is withdrawn. Where there is much more pressure on one side of a bag than the other, the fork is useful in holding the bag in place until inflated. In the absence of a bag fork, a stick is used to force in the bag, which is always snugly rolled or folded. A bag is properly placed when the axis, passing through the stem, coincides with axis of the main. In inflating large bags, a bag pump, *B* (Fig. 17) is generally used. By

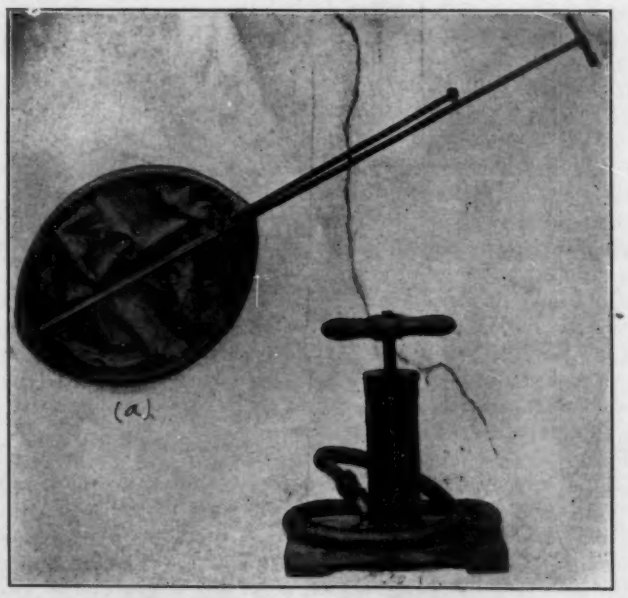

Fig. 17.—(*A*) Stopper. (*B*) Bag Pump.

means of a small bag inserted in the supply line, an indication is given of the degree of inflation of the bag in the main. This also can be told by observing the bag through the bag hole. Large bags have cocks on their stems to control the air flow, the stems of small bags are kinked and tied. A small stick should be attached to the stems of all bags to prevent their being forced away from the hole. All bags or stoppers, while in use, should be under constant supervision to insure that they are maintaining their inflation and position.

In removing a bag, the air is allowed to escape, and then the bag is slowly pulled out, first, by means of the neck, and then by pulling on the bag itself, the pull always applied close to the main, and the bag kept rolled like an umbrella. All condensation should be immediately removed from the bag with soap and warm water.

In inserting a stopper it is neatly folded and pressed together, and and pushed in carefully and slowly, the flexible frame and the handle kept uppermost until it is completely within the main.

The stopper is now revolved through 180° and pushed into the hole as far as it will go, bringing the top of the flexible frame within a few inches from the hole, and in contact with the top of the main; the bottom of the frame is on the bottom of the main, and the axis of the stopper at an angle of about 45° with the axis of the main.

The top is kept in this position, or forced slightly further from the hole by the short handle, while by the long handle the lower end is drawn back towards the hole, thus bringing the plane of the frame perpendicular with the axis of the main, and forcing the frame into a circular shape. To withdraw the stopper, the lower end is pushed forward along the bottom of the main, and the upper end is drawn back, until the frame assumes its greatest length. The stopper is then revolved 180°, bringing the frame on top, and pulled out.

Care in Regard to Supply of Gas.—Bagging off gas involves operations which, unless precautions are taken, may result in a diminution, or stoppage of supply to consumers. First, the tapping of the bag hole and subsequent opening of it, allowing free gas flow; and second, insertion of the bag interrupting gas flow in the main. The precautions to be observed in tapping the bag hole, apply to the tapping of a hole for any purpose, or to any work which makes an opening whose area is of appreciable size as compared with the area of the pipe. If flow is quickly established through the ordinary hole tapped in the average sized main, the diminution in pressure may be sufficient to put out lights turned low, as the quick uncovering of the opening, causes the pressure in the main to fall momentarily lower than is caused by a steady flow of gas through an opening. Of course the distance each side of the opening that the effect extends, and the extent of pressure lowering, depend upon the relative size of main and opening, and the conditions affecting the supply of gas to the main. Such serious results may ensue from unlighted gas issuing from burners thus extinguished that it is wise, especially in cities and large towns, to observe the following precautions.

When any opening is made in a main, the plug, tap or fitting should not be moved away from the main at right angles to it, but should be moved sidewise over the opening, and kept in contact with the main, and as it is moved off, the fitting or plug which is to take its place, should be moved on, and neither motion should be rapid or sudden. Thus at no time is the whole area of the opening exposed, and there is no rapid change in the area through which gas is escaping. When a bag hole has been tapped and the bag is to be inserted at once, in removing the tap, it should be slid sidewise over the hole followed immediately by the hand, placed in such a position as to partially encircle the tap, and to block off the escaping gas as far as possible. In inserting the bag, the hand should be moved slowly over the hole making room to insert the end of the bag, and the hand should cover the hole as much as possible, until filled by the bag. As the bag gets further in the hand should again be placed over the hole, and kept there until the bag is inflated. In withdrawing the bag, the same precautions should be observed, and, in general, everything done which will decrease the gas flow, and the rapidity of change in flow.

In addition, if the main is 3″ or smaller, or is supplied from only one end, and any portion of this supply is 3″ or smaller, a pressure gauge (Fig. 18) should be connected with the main so that any drop can be noticed, and, if at any time as little as 1.0″ pressure is shown, an examination must be made in the neighboring houses to make sure that no lights have been put out. In any work involving possible interference with the evenness of gas flow, a nearby street lamp supplied from the main should be lighted, as its flame will be a valuable telltale of what is happening in the main.

Where the records show that a main is connected at both ends, then in the absence of a stoppage, such as water in a trap, or a drip, or some other obstruction, a bag may be inserted with confidence that the result will be the stoppage of supply only to that section of main whose isolation is desired. If it is necessary to bag off a main which is not positively known to be supplied from both ends, the

work should be done as illustrated by Fig. 18. Place a bag (or stopper) through the hole, *X*, in the position, *A*, judging the flow of gas toward the bag by noting the speed of the gas escaping from the bag hole. If no drop in pressure is noticed, deflate the bag, inflate in position, *B*, and test for flow. If this test indicates a satisfactory flow, leave bag in position, *B*, and a bag inserted through, *Y*, completes the isolating of the main to be repaired or removed. The tests have demonstrated that gas is supplied in both directions, and no by-pass is necessary.

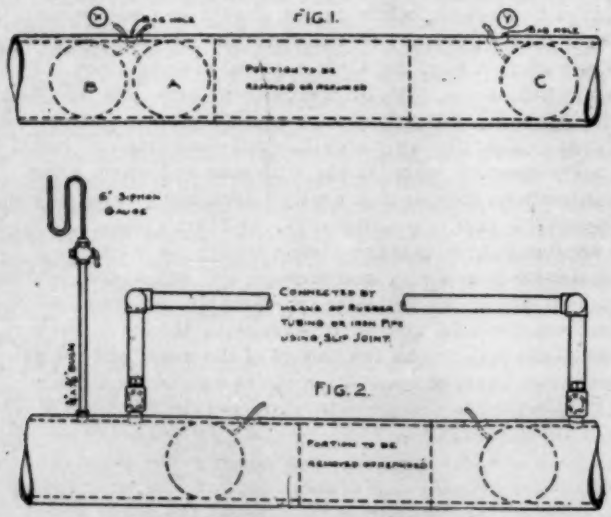

Fig. 18.—Pressure Gauge.

If on making tests a drop in pressure is noted, indicating some obstructions or a dead end, the bag should be left in position inflated until the extent of the section deprived of gas is ascertained and the meter cock in each house closed. (This same routine should be followed in any case where it is discovered that gas had been shut off from a section not meant to be isolated, before gas is again allowed to flow into it.) Before resuming the work necessitating the bagging, a siphon gauge should be attached to the section previously isolated and a by-pass laid around the section to be bagged off. The gauge should be watched while inserting or removing by-pass, bags, etc., and if at any time the pressure falls below 1.0", the gas should immediately be shut off and an examination made of each house as already described. Fig. 2 shows the bags and by-pass when ready to cut out or repair a main fed from one end only.

When withdrawing the bags, Fig. 1, the bag which was the first inflated should be withdrawn first and the pressure noted. In this way, if by any chance the supply of gas has been cut off on the side of the section first bagged off, it will at once be shown by the entire absence of pressure, and the proper precautions can be taken. When (Fig. 2) a by-pass is in place, the first bag inserted should be in the dead end supplied by the by-pass, and this bag must be the last one withdrawn.

Purging.—The operation of filling a main with gas may be very easy or very difficult, according to the length of main. In every case, however, care is needed to prevent any chance of ignition of the explosive mixture of gas and air. For a stretch of ordinary size main, ending where a little gas smell is not objectionable, purging consists of removing a screw plug from the main at the end farthest from the source of supply, and allowing first air and then mixture of gas and air to blow into the atmosphere until either by smell, or by sampling the issuing gas, it is believed that all the air has been removed. The advisability of sampling increases with the size of the main, and with the chance of a mixture of gas and air being supplied to consumers.

The sampling may be done by filling a deflated gas bag, removing it to a safe distance, inserting a burner in the stem of the bag, squeezing it and lighting the stream issuing through the burner. The color of the flame will indicate how nearly pure gas it is. An increase in the size and length of the main will mean increased volume of gas and air to be discharged into the atmosphere, and this may make advisable a standpipe screwed into the outlet hole, discharging above the heads of pedestrians; and wire gauze in the standpipe is a wise precaution, to prevent any flame which might ignite at the end from flashing back into the main. In every case of purging, the precautions noted under "Care in Regard to Supply of Gas," should be carefully observed. When the main is considered properly purged, the plugs of all drip stand pipes should be removed, to allow the escape of air pocketed in the drip pots. An arrangement used in Philadelphia on mains 16" and over is shown in Fig. 19.

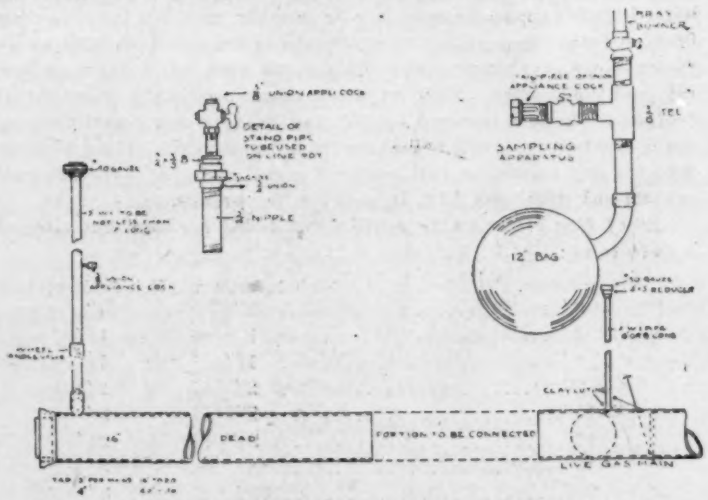

Fig 19.—Method of Purging Large Mains.

Very rarely the escape of gas may create a nuisance, as in a crowded business thoroughfare. Then the only course is to burn the issuing stream at the top of the standpipe, with gauze of mesh as small as that used in safety lamps, arranged in two pairs, two feet apart, each sheet of a pair separated by a ¼" gasket. There should be no risk of flashing back if care is taken to see that the pipe does not get warm.

Where more than a single line of main is being purged, it is necessary to bag at certain points to prevent pockets of air. For instance, when a main is fed from both ends, three bag holes, with a bag in the center hole, will allow the air to come both ways and get out without forming any pocket. In such work the tightness of the bags is very important, and each such bagging place should be under the continuous surveillance of a reliable man.

Maintenance of Gas Supply During Main Laying.

Importance of Maintaining Supply.—So far it has been assumed that the work involved an extension into new territory. Many mains are laid to replace existing lines, so it is often imperative that any cessation in gas supply be as short as possible, and that gas supply be kept up either through the existing main or temporary main, until the new main has been purged.

In considering this work three different conditions will be taken up: First, where the existing main is not in the way of the new one, and, therefore, can be kept in use; second, where the existing main must be removed to make way for the new one, but prior to such removal a temporary main may be laid; and third, where the existing main must be removed, but no temporary main is feasible.

Supply by Existing Main.—Where the existing main can continue to supply gas until the new main has been purged, the work is not much more difficult than for a new extension, except for what support may have to be provided for the existing main that may be exposed in the trench. The value of the iron recovered, even at scrap prices, generally makes it economical to lay the new main in such a location that the existing main may be removed with little additional excavation.

Before the new main is purged, all necessary service holes should be tapped, and service renewals made to within the cellar wall, so that the gas supply will be off only long enough to transfer the piping on the inlet side of the meter, from the old service to the new. When the service does not need renewing, there will be the cutting of it and its reconnection to the new main.

Supply by Temporary Main.—Usually a 2" or 3" main will be amply large, and wrought iron is preferable for any smaller than 8". The location is normally above ground close to the curb, either in roadway or on footway. Tees in the line is the best method of service connection. Each tee is joined by iron pipe, or by pipe and armored rubber hose to the existing service, involving a cessation of gas supply while the service is being cut and connected to the temporary main. Generally, the connection to the service is made outside of the curb cock, and it will be advisable, when using hose connection, to put a cock between the hose and the temporary main. This allows a quick shut-off in case the hose connection pulls off or develops a leak not capable of quick repair.

The temporary main will usually be supplied with gas through one (or perferably two) connections from the existing main system. Where a temporary main is used only during the laying of a new main, it is seldom necessary to make any provisions for condensation in the trap formed by the service connection. If the mains are laid because of the forced removal of mains during the progress of street work, and temporary supply will continue during cold weather, drip provision should be made.

Figs. 20 and 21 illustrate temporary main work.

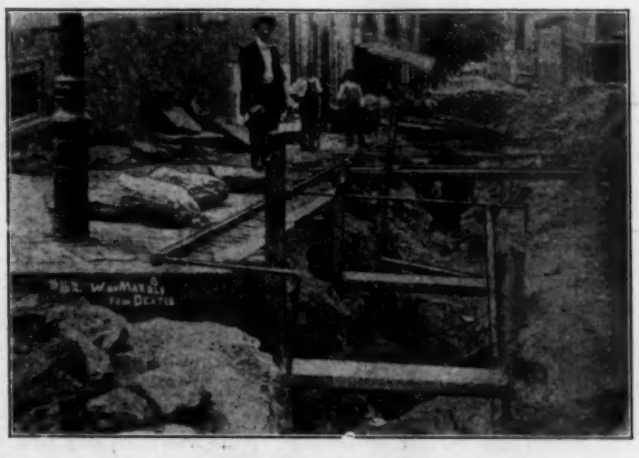

Fig. 20.—Temporary Main.

Fig. 21.—Temporary Main.

Supply in Absence of Any Main.—Cases are rare in which the existing main must be removed to allow room for the new main and no temporary main possible. Where the now existing main is fed from two directions, it could be cut out at the end from which the new main was being laid without installing a by-pass. Then the work would consist in removing the main in as small units as practicable, and in purging the new main in small sections as laid. Holes for services would be tapped in the pipe before laying, and would serve as successive purging and bag holes. In this way, no consumer need be out of gas more than one or two hours, and by special expedients this time could be reduced.

Where the existing main is fed from one end, and this the end from which the new main is laid, a by-pass would have to be installed to feed the existing main, and with the progress of the new main the position of the by-pass would be continually changing.

Refilling.

General Considerations.—The great saving in labor by loose filling or puddling, as compared with tamping and ramming, often results in their adoption where the best interests of the work and the public require ramming. The public has a right to expect refilling that will restore as promptly as possible to its original condition the surface of any trench in a roadway, where traffic is seriously incommoded until such restoration is complete. Unless the expense is very great, only good soil should be in close proximity to a main, covering it 6 inches to a foot, especially important for wrought iron or steel. The objection to refilling with stones hinges on the question of future repairs. If the trench is not apt to be opened to any great extent, a large expense for soil to replace the excavated rock would not be justified. It sometimes happens that the excavated rock can be sold, thus paying for the substituted earth. If the excavated earth freezes, it should be broken up, both as excavated and before refilling, because the larger the lumps the less material returned to the trench, and the more settlement after the frost goes out. Unfrozen material from the center of the pile should be placed around the pipe. When other conditions are acceptable, and the temperature is not so low that the water will freeze, puddling may be used to advantage with frozen material.

Ramming.—Ramming should be the practice wherever there is much travel along and over the trench, or where repaving must follow immediately. If laid with cement joints, dirt has been tamped under and along the pipe and rammed on top for a depth of several inches, except at the bell holes. If lead has been used, the amount of refilling done prior to the completion of laying work will depend upon the necessity for strengthening the trench or keeping the laborers busy. The first refilling work after the pipe has been purged is to cover any uncovered pipe, and where compact filling is necessary, there should be for every shoveler on the bank two men in the trench, tamping the earth under the pipe and between it and the trench sides; and after the pipe has been covered, or a sufficient width of trench reached, changing for a rammer. When first tamping around a pipe which is not held in position by any earth, the tampers should be in pairs, one on each side, working against each other and thus preserving the alignment. Both in tamping and ramming the lowest point on the trench should be refilled first, and the refilling thereafter carried on in horizontal planes. For mains larger than 12″, an economic width of trench for laying will not afford room enough on the side to ensure that the space under main is filled even loosely; and unless willing to incur extra excavating expense, it must be understood that there will be under all large mains a space of varying size, which will afford a gas leak a fairly free passage, making the exact locating of a future leak harder. If the main is properly blocked it will not settle, and if the trench is elsewhere properly filled, the hollow under the main will cause no earth settlement Nevertheless, an effort should be made to fill as much space as tools and trench will allow, and the larger the main, the more attention should be paid to this first tamping.

With proper proportion of rammers to shovelers and the men able to and paid to ram *hard*, there will usually be no difficulty in replacing all material removed for mains 8″ and smaller. On large mains, where earth has to be hauled away, account should be kept of such removed material, and if it exceeds the volume of the pipe laid, an explanation should be forthcoming from the foreman. Recently power rammers, driven by gasoline or compressed air, have become available. They are still in an experimental stage, but with the increasing difficulty of procuring good labor the value of such machines will increase.

In refilling and ramming, care is necessary to protect small pipes exposed in the trench from injury, especially lead water services. These, if over the pipe, should be blocked from it, or if under, from the trench bottom, the blocking tending to prevent pressure of the earth on the lead pipe pulling it out of the water main. Ramming over terra cotta pipe should be carefully done to prevent smashing and possible stoppage. If a trench is to be paved at once, refilling should stop below the surface, where the paving base begins. Otherwise the trench should be filled to the street surface, or slightly mounded. If material is lacking, enough should be procured to leave the trench surface flush with the roadway.

Occasionally in trenching it is necessary to tunnel under paving or structures. Ordinarily it is more economical to break down the tunnel roof, than to refill from the sides. Of course, if concrete road beds are concerned, breaking down is not the right course.

Puddling.—Puddling appeals to every foreman because of its cheapness, and should be used wherever conditions are favorable, and the soil is of the right kind. Puddling in a street made of filled in material, may cause a general sinking of the street surface. In built up sections it may be objectionable because of the chance of water getting into cable conduits, or because of the inability to pave at once upon the puddled material. If puddling has been decided on, the pipe should be covered 6 inches by well rammed earth before water is let in. If the trench has over 5 per cent. grade, the first ramming should reduce the grade to this. Dams at frequent intervals will prevent scouring out by water flowing down a grade, and dams will be necessary to confine the water to each terrace made by the first ramming. The preliminary ramming done, the trench is filled to about one foot from the surface, and water turned in. As the water flows along the ditch, bars are hand driven through the

loose material into the rammed earth alongside the pipe, and swung around in a circular direction, and the holes allow water to soak down around the pipe and fill any voids under it. As the earth settles more is added, until the earth is well saturated and water runs over it without being absorbed. Then the remainder of the earth is thrown in and lightly rammed. Too much ramming tends to produce a spongy condition; too much water softens the bed of the trench, causing the pipe to settle, and makes the filled trench too soggy for repaving.

If services are laid with the main work, especial care should be given to repair of the openings made in the house walls if there is to be puddling, and a dam of dirt should be thrown across every service trench at its junction with the main trench.

Loose Filling.—In unpaved streets, with ordinary size main and an interval of some months between laying and paving, there can be no objection to loose refilling of the trench. There are usually other trenches beside those made for gas, and the roller used by the paving company is relied on to compact the entire road-bed. The surface of this trench should be banked about a foot high, as a warning to wagons to keep away. It is incumbent on the gas company to make a frequent inspection of the trench to insure the prompt filling of dangerous holes after a hard rain, and some trimming of the mounded earth may be required from time to time.

Cleaning Up.—The final cleaning up after a main laying job cannot be until repaving is complete, but such as may be done before repaving will be treated now. Anyone can open trench and obstruct a street, but very few contractors clean up properly. Gas companies should see that the tearing-up of any street is followed, as quickly as possible, by the prompt execution of the work and thorough restoration to conditions previously existing. A broom and a few buckets of water are aides not often used, but generally needed in the removal of earth stains on the house fronts, side walks, tree trunks, grass, etc.

(To be Continued.)

Interpretation of the Public Utilities Law of Indiana, and its Probable Effect Upon Utilities.[1]

This is a broad text, and if I undertook to speak thereof from beginning to end I would take the entire time of your session. So I propose to take but a short time, and invite questions on the interpretation of the law and the ways to live up to it, so that I may help you and our work under the law.

The Public Utilities Regulation Law of the State of Indiana is not new. The Commission did not prepare it or even suggest it. It came from the Legislature in response to a practically unanimous demand from the citizens of the State, just as other States have demanded something of the kind. It has for its object the procuring of good service from the public utilities, at reasonable rates, with a fair return to the producers upon their investment. That is the groundwork of the law, and every section has been enacted, and should be interpreted, in the light of that intention.

Not long ago some gentlemen appeared before us asking permission to construct and operate a gas plant in the northern part of the State. They wanted to issue $200,000 stock to themselves for suggesting the gas plant, and asked us to find their services worth that amount. They also wanted to fix a gas rate that would pay operating expenses and the interest on the bonded indebtedness (they intended to pay every penny of the construction cost out of the bonds) and then a good dividend on the $200,000 stock. That is one side of the question.

A few days ago a gentleman appeared before me and said he was in trouble; that he had a small natural gas plant in the northern part of the State, and a year or two ago he had attempted to put in force a minimum charge of 50 cents per month; but as his patrons objected he did not try to make it effective. He now wanted permission to do so. I asked him, "What are you charging the people for the gas?" He answered, "15 cents a 1,000;" and that was natural gas, having twice as much heating value as your artificial gas. That is the other side of the proposition. What can you do with a man who demands that you furnish him gas at 7½ cents per 1,000 cubic feet, and then objects to a minimum charge of 50 cents a month?

These extremes have been fighting each other, and you have been in the midst of it almost from the beginning. The Public Service Commission was organized and the law enacted to stand between these two extremes of demands. There are misguided men at both ends of the road, dishonest men at both ends, too, but for the most part they are only misguided, and do not know the cost of the thing they are furnishing, or which they are using. The consumer wants it at the lowest possible price, and very naturally the producer wants the highest price he can get. A body with power to control the production and sale of these commodities or this service has been demanded by the people; a body to scientifically study and use the experience of operators and apply science in developing the field of the public utility.

I find this provision in the law: "Each public utility shall furnish to the Commission, in such form and at such time as the Commission shall require, such accounts, reports and information as we shall show in itemized detail: First, the depreciation per unit; second, the salaries and wages separately per unit; third, legal expense per unit; fourth, taxes and rental separately per unit; fifth, the quantity and value of material used per unit; sixth, sales separately per unit; seventh, the total and net cost per unit; eighth, the gross and net profit per unit; ninth, the dividends and interest per unit; tenth, surplus or reserve per unit; eleventh, prices per unit paid by consumer; and, in addition, such other items as the Commission may prescribe, in order to show fully and in detail the entire operation of a public utility in furnishing the unit of its product or service to the public."

No other section of the law has brought so many people to us as this, and the ones following it on the same subject, which had to do with the accounting feature of the law. This was the thing that was troubling my friend, who thought, if the users of the service were satisfied, the stockholders contented and the concern solvent, why couldn't he let it go at that?

When 35 years ago I wanted to build a residence, I had to hire a man by the day. He would not even undertake it by the job, and buy and pay for the material, because he could not estimate what it would cost him, or how much time it would take to do the work.

Twenty years ago I wanted to build another house, and asked a contractor what it would cost. He wanted to know how many rooms, and multiplied that by a number which he considered would be equal to the cost of one room. I contracted with him and he built the house. I am about to begin another one and I am figuring with a contractor who wants to know how many openings there will be, and what kind of casings are to go on them. Then he can tell me what it will cost to put a casing on one opening, and everything else in detail as to the construction of the house. It is needless for me to tell you that this last contractor is a prosperous man. The other two were not, because they did not understand their business, or how to ascertain the cost of a thing; and a good many utilities are operating in the same way to-day. One of our staff, inspecting telephone plants, found one of considerable size operated by a merchant who also ran a general store. He asked him, "What is your income from the telephone plant?" The answer was, "Why, Lord, I don't know; I just throw it in the drawer here." He doesn't know whether he makes $500 or $100, or whether he was making anything. How can he know what to charge his patrons for the service he is furnishing? Such is the purpose that the makers of this law had in view when they provided for a uniform system of accounting, and told the Commission just what they wanted us to obtain when that system was adopted. We must ascertain from each of you gentlemen what the legal expenses of your concern are for a year on each 1,000 cubic feet of gas. The law tells us to do it. The mandate has been handed to us by the Legislature, to prepare such a system of accounting that, when the end of the year comes and we get our reports from the various utilities of the State, every gas plant will show what it has paid for legal expenses in that year per 1,000 cubic feet of gas; and the same way with taxes. You have paid so much taxes a year; you have produced so many 1,000 cubic feet of gas, and you divide one by the other to find what the taxes have been on each 1,000 cubic feet. It looks like a difficult proposition; but it is not. The difficulty is in getting started, making up your minds as to how you are going to do it. The Commission has prepared a classification of accounts, and blanks by which it can be worked out, that is in harmony with the systems of well-managed utilities throughout the United States; a plan that will bring the results the law calls for; and that successful operators everywhere find it necessary to have in order that they may understand where they are going and what they are doing.

If the Public Service Commission is able, in two or three years, to get this system of accounts practically installed, with everybody

[1] Address by Hon. James L. Clark (Commissioner) before the Indiana Gas Association.

understanding it and seeing how easy it is to follow, we can lay before each of you, at the end of the year, an annual report in which will be tabulated for your study and guidance, the results that each utility in the State has worked out as demanded by this section of the law. You will then know whether you are paying more legal expenses per 1,000 than other companies, and the Commission will also know; they will know whether you pay more for coal than other companies, and you will know. It has been argued that under this law, or any other law for this purpose, a utility is entitled to an income sufficient to pay its operating expenses and its fixed charges, with a fair return on the investment. If the Public Service Commission denies it a rate sufficient to meet these requirements, it is a confiscation of the property of the utility, hence the rate is unlawful; and such is the law. Of course the public service law does not guarantee a profit on every investment, but it says that if a concern is prudently and economically managed a rate must be allowed sufficiently high to meet its expenses and liabilities. It has been argued that, inasmuch as that is so what incentive is there for a utility to practice economy, to instal inventions and new processes, and reduce costs?

I had that question put to me yesterday by a gentleman operating an electric light plant, and he did it in this way: "I don't know what is going to become of my plant. I have a large power house and machinery to generate an enormous volume of current, and I just learned a lamp has been invented that is so much superior to anything heretofore in use and the current it will use is so insignificant that it will make my power house useless if I install these lamps, or my patrons do." In a case like that a hardship might be worked. It cannot always be avoided, but it is no answer to the argument that it is to the interest of the utilities to produce their current, or their gas, or furnish their water or their heat, at the lowest possible price. The theory of this law is that, in order to induce utilities to do these things, we will guarantee them a monopoly. It is just as much the duty of a Public Service Commission to look after the gas plant and its owner, and protect his interests, as it is to look after the user and protect his interests. The people of Terre Haute, or of any city, want gas not for to-day only, but, so far as we know, for all time. And they want it at the most reasonable price, and with the best service that can be had. They can only have these by fostering a prosperous gas plant in their midst. They are not furthering their interest by starving a plant to death, to be followed by another to be starved to death; and so the people have said through their law, in order to get good service and reasonable prices, we will put the monopolistic spirit into this law. They say to the Public Service Commission and to the people of the State, that where a gas plant is operating in any town or city the authorities shall not permit another to be established without the consent of the Public Service Commission. The spirit of the law, as I conceive it, says to the Commission, "If the plant on the ground is doing its duty keep another out." That is an incentive to every operating plant to do its duty, to practice all economies, to install all the new inventions, and to pursue every course that is reasonable and fair and honest for giving cheap service; because it rebounds to the utility and is to its credit.

Another thing I want to mention in connection with this idea is the question of "How much." That is, what per cent. should it be allowed to make in its investments? Everybody concedes that it should make as much as the money would make in any ordinary investment of the like character, and the allowance by the Public Service Commissions of the States range around 7 per cent. of the value of the investment. If the gas plant here is worth a million dollars, on the basis of 7 per cent. return there ought to be a rate that will pay all the operating expenses and fixed charges, to set aside a depreciation fund, and to pay 7 per cent. on a million dollars. The commissions are not tied to any particular figure, and there may be conditions that would not justify so high a return, or conditions that would justify even a higher per cent. While I do not know the views of any others, for myself I do not hesitate to say that, if upon inspection of the reports from the utilities of the State, I am able to satisfy myself here is one that is better managed, is producing its output for a less price, because of its good management, I would feel willing to divide with that utility the profits of its good management and give it a higher rate upon its investment. I think that is but common honesty and fair dealing.

We have an illustration of that in our own city (I have a habit of saying "my own city," when I speak of Indianapolis, although I stubbornly refuse to live there and will as long as I have a better town within 20 miles) where some years ago they were paying, I think, 90 cents or $1 for artificial gas, and a wizard came along and said "I can manufacture gas for 60 cents." They said "Go to it; and if you can make gas for 60 cents we won't complain if you pay 10 per cent. dividends on your stock." They never have complained. They were willing he should have that rate until he paid 10 per cent. dividends. They are ready to do that everywhere. They are willing to divide the profits under reasonable management, but they want their share to be sure.

We have prepared, as you know, a uniform classification of accounts to work out these results, which have looked very "scary" to a good many people, until they comprehended them. If you examine this classification you will find it works into this law precisely, and must work into it, and without it we cannot get the results that the Legislature demands at our hands. I propose to speak of two or three features of the classification, and then I shall stop to give you an opportunity to ask me questions, because I do not want to run over the time allotted me.

The one that has caused the most trouble, so far as I have observed, is the voucher record, and the trouble with it is the size of the book more than anything else, and while that is an objection it is not a valid one. Let me talk to you a minute about the value of this voucher record and give you the experience of two or three that have used it, with a hope that it will not look so serious to you hereafter.

You will find in this classification a great number of expense accounts. If you send out an employee you give him a daily time card and he puts down the number of hours he works, digging in a trench, for instance, and if he then changes to something else he puts down the number of hours he works at that. You carry it into your payroll just that way. If you buy supplies, meters, meter repairs or pipe, you pay for them through your voucher record, and on the back of the record you separate the account. You find "meter supplies" is an account with a number. Other expenditures are distinguished by other numbers. When you enter the voucher upon the record you put in the first column the full amount of the voucher, and then divide the expenditure among the different accounts by title and column. Then you are ready to lay your voucher away. You are not required to make a journal or ledger entry of that, but when your month's work is done you then total up these columns and make your ledger entry from the footings, so that you make only 12 entries a year in each ledger account. Then the total footing in your ledger of the sub-accounts is ready to be entered on the annual report, and carried forward to your general ledger.

A good many have asked permission to carry a voucher record wiih a single column, and as they say, "spot in" the number of the account. They would enter the amount of the voucher in the general column, and so much of it to account No. X, and so much to account No. Y, etc., and then later pick the accounts out to enter them in the final report. But that would necessitate the carrying of each of these items to your sub ledger every time you make an entry, and you will have twice as much bookkeeping as when you simply put them on the voucher record and carry your totals there. I had occasion to speak about this to a Water Works Association in session in Indianapolis a few days ago. I made the observation, without having actual experience back of me, but from what I thought I could foresee that it would be less work to separate the accounts at the time you make the entry in your ledger, than to carry them along to the end of the year and then undertake to pick them out. When I got through a gentleman from Michigan arose and said, "When we received a voucher record we rebelled and said we will not carry the voucher record in that way. We will carry a single column record and at the end of the year we will pick these items out and make up our final report." They found it a little easier until they got to the final report, and then had to do 365 days' work in a week. He said, "It was a lesson to me and I took up the system you have here. It is easier and simpler. At the end of every month I can make up a balance sheet if I wish, and all through the year I can tell what my expenses are for each item. I cannot estimate the value of that voucher record in the business of a public utility.

Another gentleman, from Kentucky, said: "We have such a voucher record in our utility. When they told us to instal it, our bookkeeper said, 'I will resign.' We persuaded him to stay, and now he won't let anyone get away until he shows him that voucher record and tells him what a great thing it is for the business." No one complains of the classification, because everyone sees it is reasonable and scientific, and works right into that statute; but the forms, they say, are burdensome. You will not find them so if every one will take this system of accounting. We will help you until it is

(*Continued on page* 202.)

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NEW YORK, MONDAY, MARCH 30, 1914.

[Official Notice.]

Sixth Annual Convention, Pennsylvania Gas Association.

Pennsylvania Gas Association,
Office, the Secretary, West Chester, Pa.,
Feb. 23d, 1914.

To the Members, the Pennsylvania Gas Association: The Sixth Annual Convention, the Pennsylvania Gas Association, will be held in Allentown, Wednesday, Thursday and Friday, April 8th, 9th and 10th, 1914. The headquarters will be in the Hotel Allen. A list of the other hotels will be mailed. Early reservations are requested so that every member attending may be properly accommodated. Papers on the following subjects are promised:

"Improving Operating Conditions for Small Works."
"Office Practice."
"New Business Methods."

There will also be a number of topics up for discussion, and in order to give sufficient time to the more important subjects each member is asked to submit such subjects as he may be interested in, and the topics receiving the greatest number of requests will be considered.

All requests should be forwarded to Mr. G. S. Speaker, Lebanon, Pa.

The entertainment arranged provides for this;

Tuesday night: Informal Dutch supper.
Wednesday night: Theater.
Thursday afternoon: Open.
Thursday night: Banquet.

The Secretary requests that the postal card enclosed with each member's preliminary notification be returned at once to Mr. Crankshaw, to the end that the work of the Committee may be successfully carried out. W. O. Lamson, Jr., Secretary.

[Official Notice.]

Sixth Meeting, Southern Gas Association.

Southern Gas Association,
Office of the Secretary,
Atlanta, Ga., March 16, 1914.

The Southern Gas Association will hold its Sixth Annual Meeting at Mobile, Ala., Wednesday, Thursday and Friday, April 22, 23 and 24, 1914. In all, six papers will be presented. A complete list of these papers and authors will be sent out at a later date. However, among these papers will be one on "Equitable Gas Rates," one on "Gas Lighting," and a third on the "Construction and Operation of a Small Size Gas Plant."

There will be no special railroad rates except to the members who reside in the State of Alabama. On account of another large convention in Mobile at this time, the members will be entitled to a 3-cent per mile round-trip rate.

The Cawthorn Hotel will be headquarters for registration. Rates $1.50 per day and up. European plan. Another very good house is the Battle House, same rates as the Cawthorn. Would advise all members to make reservations as early as convenient. Official notice of meeting will be sent out April 1st. E. D. Brewer, Secretary.

BRIEFLY TOLD.

Joint National Committee on Electrolysis.—The joint committee of the American Electric Railway Association, American Railway Engineering Association, National Electric Light Association, American Telephone and Telegraph Company, American Institute of Electrical Engineers, National Bureau of Standards, National Gas Association and the American Gas Institute, has organized for active work. Mr. B. J. Arnold, Chicago, is Chairman, and Dr. E. B. Rosa, Secretary, and Professor A. F. Ganz, with Mr. J. A. Gould and Mr. J. D. von Maur, representing the Gas Institute. Mr. Calvert Townley, Chairman of the Plan and Scope Committee, gives this outline of the work intended: Electrolytic controversies have in the past given rise to unnecessary and acrimonious disputes, and not infrequently resulted in litigation between the corporations concerned. The usual procedure in disputes has been for each side to employ one or more electrical experts who generally disagree as to the cause of the trouble and the remedies therefor. The dispute often gets into the newspapers, occasioning unpleasant notoriety, and resulting in drastic action by the municipal government concerned. Much of this could be avoided if a body, such as this committee, could be created to consider broadly the questions covered by the controversy, without attempting to pass upon the questions at issue, and to report back to their respective organizations; so that in time the committee would come to be recognized as a neutral body whose decisions would be authoritative, the same as the Standards Committee of the American Institute of Electrical Engineers in connection with matters of definition and standardization, which is a recognized authority that no one attempts to question. With that end in view the Institute initiated this movement to organize a national body to consider the general subject, and agree upon basic principles, or methods of procedure, to be followed in cases of electrolytic disputes. It is not the purpose of the committee to act as an arbitration board in controversies, thereby taking the place of executives or the courts.

Holding Companies.—The advantages of the holding company as a means of developing the public utilities of scattered communities were emphasized by Francis T. Homer, of Bertron, Griscom & Co., in an address a few days ago before the Finance Forum of the West Side Y. M. C. A., New York city, in which he drew a sharp line of demarcation between such corporations and that class of holding companies that had been used to establish industrial monopolies. Speaking of these advantages, Mr. Homer said:

"No separate public utility can afford the large expense incident to maintaining available, instantly responsive to its demands, a trained corps of able and effective engineers, because for long periods of time their services are not requisite, and when required, the isolated utility finds difficulty in securing advice of the persons best qualified to recommend in respect of the intricate problems involved in the performance of its public service duties. For this purpose is essential not only technical ability, but also an understanding of the peculiar individual requirements of each locality—the normal and probable rate of growth, the districts of probable rapid and slow development, the ultimate boundaries of growth. This information is available only to the engineer who has acquired an intimate acquaintance with the community involved, its present and future needs. The large holding companies are able to maintain such a corps of engineers, and the cost of their employment is distributed over a great number of subsidiaries, and therefore is not burdensome. By standardizing construction work in the different communities, they reduce building costs and establish a situation whereby the equipment or plant, whose capacity has been outgrown by the requirements of one community, does not become useless, but is available for service in a smaller community, whose full requirements it can supply. Thus, the depreciation costs to the public are minimized.

"Public service is recognized as a natural monopoly. Competition has been demonstrated to be a mistake, and in all States where public service commissions are in control, a certificate of public necessity and convenience has been established as a prerequisite for a competitive franchise, even where a community has been induced to grant one. This being so, each public service company loses the advantage of maintaining a high standard of efficiency through the spirit of competition.

"A holding company, operating many utilities, gives to each community all the benefits of the natural monopoly, without losing the spur of comparative competition, as it is constantly directing the attention of the managers of its subsidiaries to the efficient results accomplished by its managers in other communities.

"In no field are the benefits of the holding companies more manifest than in the matter of the financial strength and assistance which they bring to their subsidiaries. Many a community now enjoying adequate and high class service would not have been able to secure the financing of a public service corporation in its midst as a con-

struction proposition except for the helping hand of the holding company. Many an independent company, financed to perform a public service, has met with shipwreck because of inadequate provision to carry its operating deficits in the early years of business, which a holding company could have saved from financial disaster by carrying the losses of such subsidiary out of the profits from other held companies.

"Again, it is difficult to secure a market for the public utility issues of companies in small communities, because the issues are small and the number of persons interested therein, and, consequently, familiar with their worth, is likewise contracted and narrow."

"GOING VALUE" POSITIVELY RECOGNIZED.—Last week the Court of Appeals, New York, squarely decreed, by virtue of a unanimous opinion, that a public service corporation is entitled to figure in appraisal a fair return on the "going value" of the property of a corporation, when said appraisal is intended as a base for rate making purposes. The principle was declared in a decision (written by Mr. Justice Miller) reversing the determination of the New York Public Service Commission, First District, which decreed that the Kings County Lighting Company should reduce the rate charged for gas to the residents of the 30th Brooklyn Ward, from 85 cents to 80 cents per 1,000. It may be noted this is the first time in the annals of the State that this point has been adjudicated in the final court. The decision also holds that a corporation may not include in its tangible assets amounts paid for street improvement and the appreciation in value of the lands owned. The lighting company issue is sent back to the Commission for redetermination. Quoting from the text of the opinion: "I define 'going value' for rate purposes, as involved in this case, to be the amount equal to the deficiency of the net earnings below a fair return on the actual investment due solely to the time and expenditures reasonably necessary and proper to the development of the business and property to its present stage and not comprised in the valuation of the physical property. Going value is to be appraised by showing the actual expenditures of the company, the original investment, its earnings from the start, the time actually required and the expenses incurred in building up the business, all expenditures not reflected by the present condition of physical property, the extent to which bad management or other causes prevent or deplete earnings, and any other facts bearing on the question, keeping in mind that the ultimate fact to be determined is not the amount of the expenditures, but the deficiency in the fair return to investors due to causes under consideration. The difficulty of determining the 'going value' will not justify the disregard of it. Rate making is difficult; but that will not justify confiscation. It may be conceded that going value has no existence apart from tangible property, and that commercially there is but one value, that of the property as a whole, but as the rate cannot be made to depend upon the exchange value, which would in turn depend upon the rate, it would seem to be necessary to appraise the physical property and the going value separately."

CURRENT MENTION.—

THE Gas Machinery Company, of Cleveland, Ohio, has contracts with "Poetter, Gesellschaft mit Beschrankter Haftung," Dusseldorf, Germany, for the exclusive placing of the Hilger rotary gas producer in the United States, Canada and Mexico. The Hilger type of producer is extensively used throughout Europe and Asia, frequently displacing other makes. The Corporation Poetter, Dusseldorf, Germany, has been manufacturing Hilger producers since 1910, and has installed several hundreds for use on all grades of fuel. In Europe the Hilger gas producers are being installed with greater frequency than any other type of rotating grate, or twisting zone producers combined. This being due no doubt to the high efficiency to be obtained from the back-and-forth rotating grate, which is simple in construction, with the reliability that goes therewith. The many repeated orders received are the best evidence of satisfactory operation. The well-known firm of Krupp, with headquarters in Essen, Germany, in 1913 entered into a contract to hereafter use Hilger producers. The Hilger apparatus is protected by Letters Patent in many countries, and other patents are pending. The Gas Machinery Company's "Bulletin" describing the Hilger producer will be ready for distribution in about 3 weeks.

THE proprietors of the Greenville (Texas) Gas Company announce an increase it its capital, that will bring the latter to $150,000.

"L. V. T.," writing from Buffalo, N. Y., under date of the 23d inst., says: "It looks that the seemingly interminable gas controversy here is in a fair way of adjudication. On the 18th inst., City Attorney Sanders and Louis L. Babcock reviewed testimony and papers in the matter of the Buffalo Gas Company against the city, under which complainant seeks to collect $237,000 due it for gas supplied on public account. Their conferences will end in a settlement, if the statements made by Mayor Fuhrman and F. D. Locke, counsel for the Company, following a conclave between them, are sound. The settlement will, it is claimed, be on the basis of a 90 cent rate, and a reduction of $25,000 from the total bill in dispute. This settlement, it should be understood, will have no bearing whatever on the current appeal to the Public Service Commission by certain customers, asking that the prevailing rate on ordinary account be reduced."

MR. C. E. JAMES, of the Durham (Tenn.) Coal and Iron Company, declares that the Company has authorized the immediate building in Chattanooga of a huge construction of coke ovens. These are to be built in blocks of 30 and 60. The initial plant will bake off 800 net tons of slack each 24 hours, and about five millions cubic feet of gas per day will be for sale. All of the by-products will be recovered. Work is to commence on the initial set of ovens as soon as the drawings are completed, which period will be reached about mid-April. It is estimated that the first completed installation will involve an expenditure of $1,000,000.

"BRANCH," writing from Concord, Cal., under date of March 19th, says that Mr. S. Waldo Coleman, representing a syndicate that is proposing to operate a high pressure gas distributing system in Concord, Martinez, Antioch and Pittsburg, Contra Costa County, Cal., has asked the State Railroad Commission for a certificate of public convenience and necessity authorizing him to proceed. Coleman has been granted a franchise by the Concord Board of Trustees, and his applications for like permits are under consideration by the authorities of the other named places. He has been granted a certificate to operate in the county under a franchise issued by the Supervisors.

MR. BLAINE GAVETT, of Grand Rapids, Mich., in whose name the franchise for furnishing gas to Zeeland, Mich., was granted, has filed a notice with the County Clerk of Ottawa County, at Grand Haven, Mich., to the effect that he will do business under the name of the Ottawa County Gas Company, for the purpose of serving Zeeland and Holland Township with gas.

Correspondence.

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

As to Heights of Gasholders in Greater New York.

DYKMAN, OELAND & KUHN,
177 Montague Street, Brooklyn, N. Y.
March 25, 1914.

To the Editors, AMERICAN GAS LIGHT JOURNAL: Permit me to call to your attention a misstatement of facts that appeared in the AMERICAN GAS LIGHT JOURNAL for March 23d, 1914, page 190. In commenting upon my appearance for the Brooklyn Union Gas Company, and other Gas Companies in New York city, before the New York Board of Estimate, in opposition to the recommendation of the Advisory Committee restricting the proposed limiting of the height of structures in Greater New York, you said:

"Mr. Lawson Purdy, prominent on the Advisory Committee, and President McAneny as well, both informed Mr. Kuhn that the present recommendations did not concern gasholder limitations, and the added promise was made that gasholder heights would be discussed when the present matter of heights of buildings had been disposed of. It looks that over-carefulness in this instance may result in trouble later on to gas work operators."

Neither Mr. Purdy nor President McAneny stated that the present recommendations did not concern gasholder limitations; but, on the contrary, they stated that the question of exempting gasholders from the proposed regulation had not been before called to their attention, and that, upon account of my objections, it would be given due consideration in the framing of an ordinance to be adopted.

In the recommendation of the Committee, made to the Board of Estimate, gasholders were not exempted, but, by the general terms of the recommendations, were *included*. If the recommendations of the Committee were adopted, it would be impossible to build gasholders 200 feet high in Greater New York city. In Boston, after a similar ordinance was enacted (1904) it was neccssary to have it amended in 1905 by special legislation. "A stitch in time saves nine."

Yours very truly, JNO. J. KUHN.

(*Continued from page* 199.)

thoroughly understood. In two years from now, legislation could not make you quit it. These accounts are being used in other States. The system will be well known to everybody in a little while, and its value is in its uniformity. When you meet a gas man from any place, you can talk accounts with him, because he keeps his books in the same way you do. You can compare notes and you can advise each other in a way that you cannot do now, and you will get from the annual reports the benefit of every ma n's operations.

Gas Explosion Under Street Surface.

On Sunday morning, March 8th, an explosion of gas, on the south side of 23d street, at Fifth avenue, New York city, made a 25 foot rent in the street, reaching from the surface car tracks nearly to the curb, and opened a smaller hole on the north side about 10 feet by 7.

Hole on South Side of 23d Street.

The sequence of events seems to have been this: The 48-inch water line at the intersection of the three highways meeting at this point broke at about 8 A.M., undermining the 6-inch gas main near it, which in turn sagged or broke, allowing an escape of gas, and this was ignited by sparks from some one of the numerous underground electrical conductors buried there. A west-bound surface car was directly over the spot where it exploded, severely shaking up the occupants, some 8 or 10 being painfully injured. If the accident had occurred on any other day than Sunday considerable loss of life might have resulted, as this is one of the city's busiest corners.

The Newest Gas.

In the JOURNAL of January 26th, 1914, page 62, is an account of the suggestions of Professor Strache for making a mixed coal and water gas in a combination apparatus. A description of an English plant operating on such a principle, appears in a late number of the "Gas World" (London).

The generator is similar to the well known K. & A. water gas scheme and is patented by the same interests. The outside shell is of cross section and divided into two parts by a central partition reaching within a short distance of the bottom. It will be noticed from the sectional sketch that each generator is made up of two parts; a larger round coke receptacle in the base, and an upper tapered portion D-shaped, a charging pouch for the coke or coal. At the top of the lower generator are series of "nostril" holes. The D-shaped portions of the generators have an outlet at the top, whilst the regenerators have ports which serve as both inlets and outlets. A single blast inlet is provided midway between the two generators, under

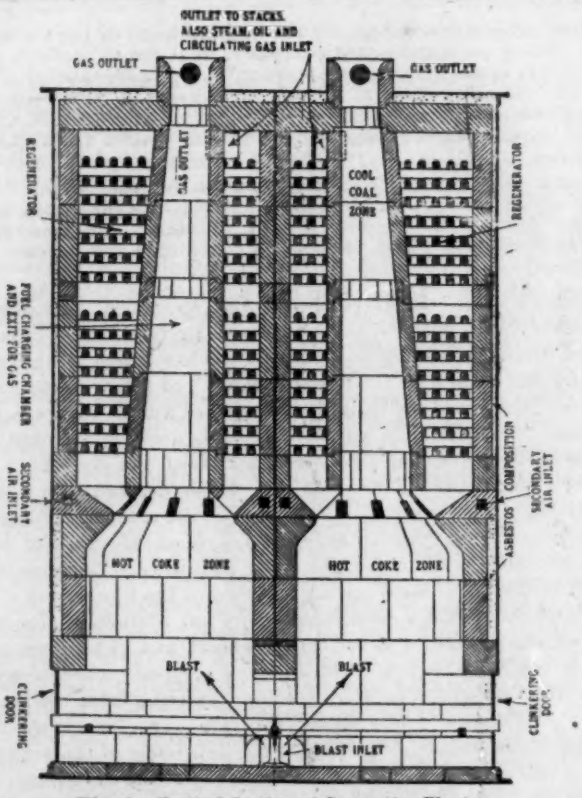


Fig. 1.—Vertical Section of Generating Plant.

the fire-bars. As the plants so far erected have been for making water gas, the method of operating for this will be first described. Assuming that the generators, both upper and lower, are charged and that

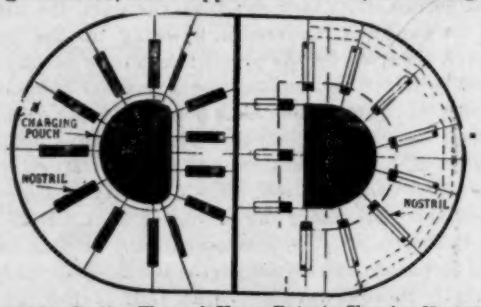


Fig 2.—Section Through Upper Retorts, Showing Nostrils

the heats have been gotten up, a "blow" is made by admitting blast through the inlet in the centre. The current of air splits into two streams and travels through both coke beds as far as the nostrils. As the valves at the top of the -shaped generators are closed, the products of the "blow" cannot force an exit this way, passing through the "nostrils," traverse the regenerators, and finally out into the air through the stack valves. In this way the fuel in the generators is brought up to heat, and the products passing through the regenerators give up a further quantity of heat, so that the latter are maintained at a considerable temperature. The blast gases passing through the nostrils contain about 10 per cent. of carbonic oxide, and this is burned to CO_2 by the admission of secondary air. The "blow" usually continues for rather more than a minute; the blast having been shut off and the stack valves closed, steam is admitted at the top of the regenerator on one side only. Passing downward around the heated chequer work, it travels first through one coke bed and finally through the second. In this way long contact with the fuel and thorough "reducing" are assured. Leaving the second fuel bed, the water gas produced does not pass through the nostrils (the stack valve being closed) but forces its way through the cool core of fuel in the D-shaped pouch, into the hydraulic main and, finally, through the scrubber. One advantage of passing the hot gas through the incoming coke is that the greater part of the moisture is driven off from the fuel, and the outgoing gas is thoroughly filtered.

In the cycle described no mention has been made as so how carburation is effected. For this purpose air from a compressor is admitted to a storage tank, and the oil forced out at a pressure of from 30 to 40 pounds through a spray into the top of the regenerator. Each regenerator is fitted with a spray, but the oil is admitted only to that side through which the gas passes last. The oil gas is thus forced

downward, passes through the nostrils, meets the upgoing stream of blue water gas, and the two are then thoroughly mixed during their passage through the cooler coke core.

It is usual, after a one minute blow, to admit steam for 5 minutes, and after the next blow, the direction of the steam is reversed. One plant recently erected has been found to give quite satisfactory results if, after a blow of two minutes, a "double run" is carried out, *i. e.*, a run of five minutes in each direction. Clinkering is usually necessary once in every 24 hours.

When starting up the plant the first time, the two generators and their upper components should be charged with coke. For charging coal each generator is fitted with an automatic feed, regulated to supply a practically continuous charge, similar to the arrangements on vertical-retort installations. In this way the coke consumed in the generators is continuously replaced by the in-going charge of coal. When the coke originally charged is up to the requisite heat, gas-making may commence by turning on steam in the same manner as for making water gas. At first, of course, only water gas will be made, but the product gradually undergoes a change after the first charge of coal has been admitted.

What takes place is this: Coke is consumed in the lower generators, and a further supply falls down from the upper cool zone to replace the loss. The coke in the D-shaped pouch is thereby lowered, but the difference is simultaneously made up by the small incoming charge of coal. During the five minutes run the water gas evolved from the coke passes up through the cooler zone and partly carbonizes the coal newly charged, the two gases passing off together. Coal gradually works its way down the upper portion of the generator, being carbonized more and more during its travel, and is usually reduced to coke by the time it has reached a point about two-thirds the way down the pouch. For about five minutes, the two gases are driven away in this manner, and then the heats have to be picked up again by a blow.

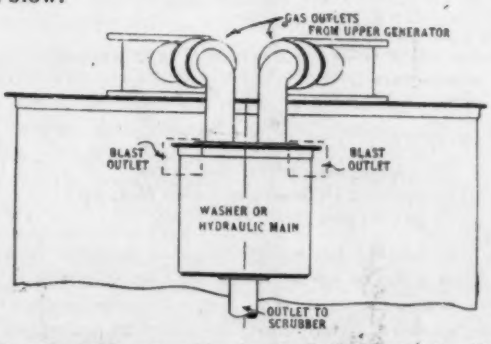


Fig. 3.—Top of Generators, Showing Gas Outlets and Hydraulic Main.

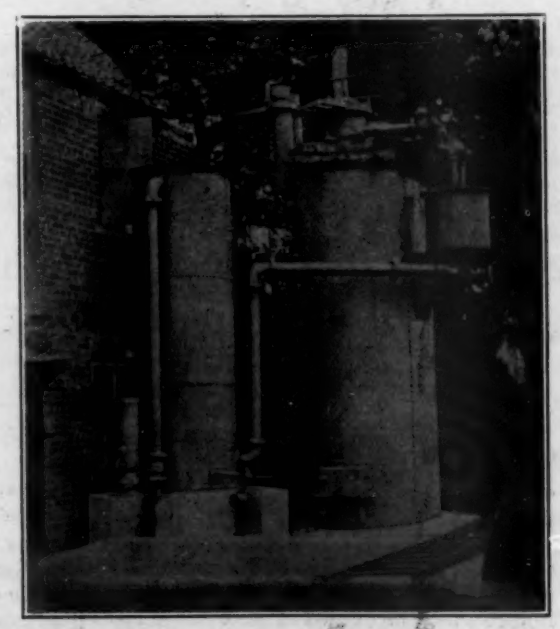


Fig. 4.—View of Complete Plant; Capacity 50,000 Cubic Feet per Day.

Very little coal gas will be evolved during the one minute blow. The blast is admitted at the base of the generators, and passing through the regenerators goes out by the stack valve. The coal in the upper portion of the pouch is giving off a small amount of gas, but the pressure is not sufficient to overcome the blast pressure and cannot, therefore, travel downwards. It is accordingly stored in the upper portion of the pouch under pressure, and on the commencement of the next run forces its way through the seal. In this way practically no loss takes place.

Oil may also be admitted during the runs, and coal gas and carbureted water gas mixture be obtained.

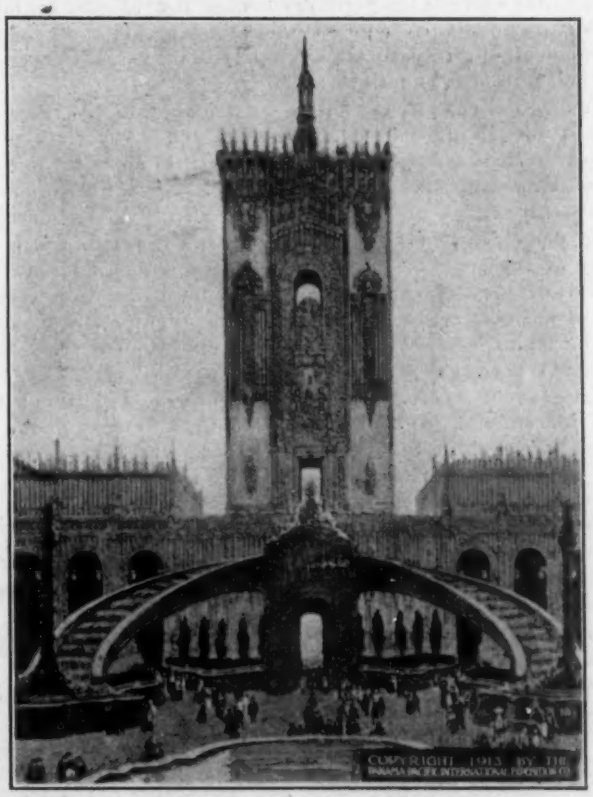
One of the interesting optional features of the plant is an automatic device which arranges for the entire operation, doing away with all labor, except that for clinkering. The device consists of a large wheel, with projections in the nature of cams. The wheel revolves by power, and the cams operate valves, admitting steam to cylinders, these operating the main air and steam valves, etc., on the plant. The cycle of runs and blows is accordingly dependent upon the rate of revolution of this operating wheel.

Fig. 3 is a sketch showing the outlet pipes and the hydraulic main, Fig. 4 a photograph of a plant (at present making carbureted water gas) erected some few months ago.

The cost of such an installation is decidedly moderate, and usually averages about $75 per thousand cubic feet of gas made per diem, including steam boiler and oil tank.

Lighting Effects with Gas and Steam.

It is announced by those in authority that some spectacular effects in lighting, at the Panama Pacific International Exposition, will be produced by combining gas lighting and steam vapor.



In the Court of Abundance the designers' theme is the creation and development of the world, presenting a symbolic idea of the history of the human race. The rise of man will be represented in its gradations, from the lowest forms of life through all its ascending stages.

The court will be illuminated almost exclusively by high pressure gas. From urns placed about the court and on the borders of a lagoon in the center, twisting gas flames 10 to 15 feet in height will rise. Great sheets of flame will lick the sides of the court, and rise along the facades and up the scores of columns supporting huge carved figures of prehistoric men. The court will be in an atmosphere of haze created by steam from perforated pipes laid along the ground, the cloudy vapor and the reddish-yellow flames producing an effect of mystery which the architectural scheme will accentuate.

It is the intention to have gas released under the water in the lagoon to be ignited upon reaching the air, but the details of this have not yet been worked out.

As a substitute for the usual pyrotechnic displays, set pieces made of pipe are being placed near the scintillator—a battery of forty eight 36-inch searchlight projectors—on the bay front of the site. From these pipes steam will be forced and the clouds of vapor illuminated in various colors and combinations by the scintillator.

The Manufacture of Blaugas.[1]

[By Dr. Hugo Lieber.]

The great advantages from the use of gas have created a considerable demand for a supply outside the territory traversed by gas mains, and many attempts were made to fill this demand by the production of a compressed or condensed gas in such form that it would be commercially transportable.

In the experiments conducted by various investigations, coal gas, as well as oil gas, was used, but attempts to produce a commercially condensed and transportable coal gas were soon abandoned in favor of oil gas, on account of the higher calorific value of the latter. The compressed oil gas is to-day still used very extensively, especially for lighting of railroads, buoys, lighthouses, etc.

With such compressed oil gas, the name of Pintsch is usually identified owing to the great introduction of the Pintsch system.

Under this system the oil is distilled at fairly high temperatures (900 to 1,000° C.) so as to produce as large a quantity of fixed gas as possible. These fixed gases are subjected to pressures of from 6 to 10 atmospheres, in the United States 6 atmospheres being the prevailing pressure. After distillation and compression, some of the hydro-carbons are liquefied, these have to be removed, and only the remaining gaseous hydro-carbons are permitted to enter the shipping containers.

A German chemist, Herman Blau, has made great improvements in the production of a transportable compressed oil gas, the process employed being in brief as follows:

In the original process, gas oil is conducted into the retorts the same as in the manufacture of Pintsch gas, and is vaporized and decomposed in these retorts under a temperature of about 500 to 600° C. This low temperature is employed in order to prevent the production of a large percentage of fixed gases, as contrary to the heretofore existing principle, it was the desire of Blau to produce as large a quantity of the coercible hydro-carbons and as small a quantity of the permanent gases as possible. After the oil has thus been distilled, the gas obtained is conducted in the usual manner through hydraulic mains, coolers, cleaners and scrubbers, to remove the tar, etc. After this the gas is purified of its chemical impurities, especially sulphide of hydrogen and carbon dioxide, and conducted to holders for storage. With the exception the difference in the temperatures employed in the distillation process, the Blau process, up to this point, does not vary materially from any of the other well known processes of oil gas distillation.

In the first process employed by Blau, the gas from the holder was drawn into a cooler where, under a suitable process, it was cooled considerably below zero, in order to liquefy and discard certain of the coercible hydro-carbons not desired in the finished product; that is, such hydro-carbons as under normal pressure and temperature would again liquefy. Under the process employed in Blaugas factories at the present time, this preliminary cooling has been discarded. The gas is drawn directly from the holder to the compressor, which is usually a three-stage or four-stage compressor; the liquefying and discarding of these coercible hydro-carbons taking place in the first and second stage of the compressor, and the balance of the gas passes on into the third and eventually the fourth stage, where the gas is compressed up to 100 atmospheres. During all stages of the compression water is injected into the compressing chambers for lubricating and cooling purpose, and separated from the liquefied hydro-carbons after the last stage of compression. The tar obtained from the cooled and scrubbed gases is collected and sprayed under the retorts, as fuel to supply the heat required.

In these processes some permanent gases have been produced which the liquefied hydro-carbons have been unable to absorb, and these gases are stored in large cylinders, from which, by means of proper reducing and regulating valves, they are conducted to the engine, where they produce all the power needed in the plant.

The final product, consisting of liquefied hydro-carbons, and non-liquefied hydro-carbons absorbed by them, is of such composition that this whole aggregate will remain liquid as long as under the pressure employed in the process, but will at once become converted into a gaseous aggregate if the presure is reduced to approximately atmospheric pressure.

Under the compression of 100 atmospheres the gas is reduced to 1/400 of its volume, and the gas has a specific gravity approximately the same as atmospheric air. One ltr., that is, 1.246 gr. of Blaugas at 0° C. and 760 mm barometer, contains 1.042 gr. carbon and 0.204 gr. hydrogen, and has a calorific value of about 1,800 B.t.u. per cubic foot.

The explosive range of Blaugas is lower than that of any other commercial illuminating gas, which the following table will show:

	From		To		Explosive Range.
Coal gas.....	6.33 per cent. gas.	93.67 " air.	19.33 per cent. gas.	80.67 " air.	13 pr. ct.
Acetylene....	2 " gas.	98 " air.	49 " gas.	51 " air.	47 "
Hydrogen....	9.5 " gas.	90.5 " air.	66.3 " gas.	33.7 " air.	56.8 "
Blaugas.....	4 " gas.	96 " air.	8 " gas.	92 " air.	4 "

As stated before, the heat value per cubic foot of Blaugas is about 1,800 B. T. U., whereas that of acetylene is 1,500 B. T. U., and of hydrogen 425 B T.U. As the volume of Blaugas is reduced to 1/400 by compression, it requires much smaller receptacles to transport a certain number of heat units in Blaugas than with any other gas.

Acetylene can be considered a transportable gas under the so-called "Acetylene Dissous" system, and the following table shows the heat value per cubic foot, the container capacity, the weight of containers required, the number of containers required, and the price per 100,000 B. T. U.:

	Hydrogen.	Acetylene	Blaugas.
Heat value, per cu. ft.....	425 B.T.U.	1,500 B.T.U.	1,800 B.T.U.
Contents of a container of 1 cu. ft. capacity..	120 cu. ft.	100 cu. ft.	300 cu. ft.
Weight of containers required to transport a given quantity of heat units (for example 540,000 B.T.U.)	1,060 pounds.	432 pounds.	100 pounds.
Number of containers required to ship 5,400,000 B.T.U.	106	36	10
Price for 100,000 B.T.U.....	$1.41	$1.00	44c.

Hydrogen per cubic feet, 3/5c.
Acetylene Dissous per cubic feet, 1⅓c.
Blaugas, per cubic feet, 4/5c.

Blaugas is transported in steel cylinders ranging in size (water capacity) of from ¼ ltr. to about 100 ltrs. The size mostly used in a cylinder with a water capacity of 27 ltrs., or about 1 cubic foot. This cylinder, when properly filled, contains about 20 pounds of Blaugas, which will be converted into about 250 cubic feet of expanded gas when the pressure is released. As Blaugas contains no carbon monoxide, it is non-poisonous.

It is used very extensively for steel and cast-iron welding and cutting, brazing, soldering, and for laborataries, where a uniform gas, with high heat units, is essential. In districts where gas is not supplied through mains, Blaugas is used for illuminating, cooking, heating, and similar purposes.

The cylinders are attached by means of a reducing valve to a small expansion tank, and from there the gas is conducted into the piping by a pressure regulator.

1. "Metallurgical and Chemical Engineering."

Special English Correspondence.

Communicated by Norton H. Humphrys.

Salisbury, England, March 10, 1914.

Blakeley's Columnless Gasholder.—Free Gas Appliances at Manchester.—Remarkable Carbonizing Figures.—An Impending Mantle Combine.

I am interested in seeing in your columns—*ante* p. 109—an illustrated description of Blakeley's patent gasholder, and some additional particulars may be interesting. About a year ago, I was laying out the plans of a small "K. & A." water gas set for the works at Westbury, and the inventor brought to my notice this patented system of gasholder guiding, which he offered to erect subject to a guarantee that if unsatisfactory he would add columns and girders, and convert to ordinary pattern, at his own expense. As a practical man, there were several points about the proposition that appealed to me. When it is a question of paying as much for the patentee's royalty as the cost of the columns and girders I have usually preferred the latter. If the wheels are adjusted once every 2 years, and generally attended

to, the ordinary system of columns and girders takes a lot of beating. But the points that attracted my attention were that the holder rises and falls vertically, putting no side or torsional strain on the tank, and that all the wheels are at ground level, and easy of access for inspection or lubrication. These matters are of special importance for a relief holder, which gets considerably more work to do than a distributing holder. in which the make, for some hours of the day, runs within easy distance of the consumption. It should also be observed that wind strain is taken up by the piers, as in the ordinary construction, and is not distributed over the whole circumference of the tank wall, and therefore puts no extra strain on the top of the tank, which is necessarily the weakest part. This holder is 30 feet diameter by 12 feet high, has now been in continuous operation for 4 months, and has proved an entire success. The extra weight of the guides on the sides seems to have a steadying effect, and there is an absolutely steady gauge under all conditions of work. I have watched the holder when nearly full, under a high wind, and there was no sign of oscillation. When, on any occasion the question of a new holder comes forward, I shall certainly consider this method of construction.

Mr. J. G. Newbigging, the Chief Engineer of the Manchester Corporation Gas Works, delivered a most interesting and important address at the spring meeting of the Manchester Institution of Gas Engineers. The development of our industry has brought to the front a new class of man, who can talk with equal facility about constructive engineering, chemistry, accounts and bookkeeping, financial questions, dealing with workmen, a progressive policy in regard to consumers, the management of the sales office, and other cognate topics; and Mr. Newbigging is an excellent example of this class. One of his points—the free fixing of cookers and gas fires—has lately been referred to in these letters, and he is no half-hearted supporter of this policy. He pronounces in favor of an inclusive price for gas, to cover the use of the meters, cookers and other appliances, as far as possible; considering that any initial charge or periodical charge for hire is a deterrent to new business. But he admits that such a system calls for vigilance by the management, to make sure that the appliances are being used to a sufficient extent to justify the free fitting, as otherwise considerable loss would result. This means that the free fitting must be conditional, or attended with a guarantee for a fixed minimum consumption, determined by the cost of the apparatus; and it may be urged that all conditions, whether for a minimum consumption, or taking the form of initial or periodical charges, are a deterrent. The question to be decided is, which is the least objectionable. Some people demur to signing anything in the way of a guarantee, but will cheerfully pay a small charge for rent, with the quarterly gas account.

Mr. Newbigging remarks that a notable effect of the modern practice of fixing automatic meters and appliances on direct or indirect hire, is to increase the proportion of management and distribution charges as compared with the total cost of gas delivered at the consumers' meter, and that one of the most efficient ways of reducing it is to increase the consumption per consumer. Manchester began renting cookers 30 years ago, and the charge for hire and fixing was abolished in 1903, because it was found that for some years the demand had been at a stand still. At that date the number in use was 12,800, and the result was a steady increase, and they now have 65,730, with the demand continually growing. The consumption of gas was close on 800 million cubic feet per annum. Gas fires were not let on hire before 1911, and are on a small rent, or special sizes on hire purchase. Periodical inspections and maintenance are necessary, and over 10,000 gas fires are in use. Low price gas is important in spreading the use of gaseous heating, because its general use can only be justified on economical grounds. On this point it may be remarked that at Manchester coal is cheap, but no doubt the recent advances in price of coal have greatly facilitated the introduction of gaseous fuel.

The most attractive part of the address, from a gas engineer's point of view, was the section devoted to carbonization. Mr. Newbigging opines that we are within measurable distance of making the by-products pay the whole cost of the gas in the holder, and that undertakings with a low capital account will be able to sell gas at less than 24 cents per 1,000 cubic feet. Such a price would secure large increases in the use of gas for fuel, to the advantage of the community and the industry. Referring to the position of carbureted water gas, he said that the great advance in the price of oil, which was like to be more or less permanent, placed the economic question of distributing a mixed gas on quite a different footing, to that which existed some years ago. There is not only advance in cost of oil to consider, but also the improved methods of carbonizing coal that are now available; and, under such circumstances, he could not conceive any undertaking lightly entering upon extensions of plant for the manufacture of water gas. But he did not lose sight of the assistance that such plant had afforded in the matter of coke disposal. However, he suggested that the means for finding outlets for coke were not exhausted, and that what some termed over production was really faulty distribution. There was also the flexibility of the plant in meeting sudden demands, but against this was the objection to making a marked variation in the composition of the gas distributed. For these reasons, he considered that water gas would eventually be discarded, except for stand by purposes. He backed up these opinions by a comparative statement of the cost of making some 4,800 millions cubic feet of coal gas, and 1,156 millions cubic feet of carbureted water gas, for the supply of Manchester in 1913. The gross cost of coal and cannel was just over one shilling per 1,000 cubic feet, and the receipts for residuals a trifle less. Purification shows a very decent profit, and the actual net cost of manufacturing and purifying material was only one-third of a penny per 1,000 cubic feet. The average cost of coal and cannel over the year was 12s. 1½d. per ton. Many of his neighbors share this advantage, but, taking the average over the country, the cost is more like 18s. Wages, repairs, salaries, and sundry costs, bring actual cost of the gas at the outlet of the holder to 6½d. per 1,000 cubic feet. Water gas yields no residuals worth the name, and, therefore, although the gross cost of materials comes out at less than 8d., or two-thirds that of the coal, the net cost is 7d. The whole of the other expenses is less than for those of coal gas, by something more than 50 per cent., the actual figure being approximately 2½d. Manchester enjoys the advantage of cheap oil as well as cheap coal, the average cost for the year being 2d. per gallon. So it is evident that anyone who can approximate to the Manchester figures will save money by keeping to coal gas, with an eye, of course, to the incidental advantages of carbureted water gas above instanced.

Such a clear comparative statement is especially welcome, because the published accounts of gas companies do not throw much light on the subject. In order to have an entirely separate staff for each department, a large scale of operations is necessary. In a smaller works the duties necessarily overlap, one foreman supervising the whole, the necessary steam is taken from the general works supply, and the same with regard to the tools, oil, and general repairs. Manchester also appears to enjoy the advantage of exceptionally good prices for spent purifying materials.

The old idea of the way to increase selling prices was to increase quality, and trust consumers to appreciate it, and to be willing to pay for it. The new idea is to resort to force in some form, not neglecting the primitive brickbat if more refined methods fail. Labor parties run their union, and their members of Parliament, all for the purpose of getting a higher price for their labor, than is warranted by the prosiac laws of supply and demand. Any idea of getting more by making themselves worth more is an absolute back number. But sometimes I have thought that I would like to see how a union started on the old idea, would be treated by workmen. It would have some resemblance to a Gas Managers' Association, which is usually devoted, not to the personal benefit of the members, but to the advancement of all matters pertaining to the industry. Why should there not, for example, be a labor Association on similar lines, where questions of improving the output and methods of labor would be considered, especially in view of the inroads made by machinery on the demand for unskilled labor. Nearly all lines of manufacture have their particular combine for keeping up prices, ranging from a more or less informal understanding, to a full blown association, so it is not surprising that the manufacturers of incandescent mantles have held an international convention at Berlin, for the purpose of improving the conditions of the trade, which in plain English means charging higher prices to the consumer. One of the reasons alleged for the proposed combine is that inverted mantles last longer than the upright, but what connection this has with the actual output is not very obvious. A more durable article will command a more extensive sale, and consequently the actual output may be greater. Then there are the Thoria manufacturers, who appear to resemble colliery proprietors in so much that they manage to get a good living, according to their own version, by following the lead of the Irish shopkeeper, who ticketed his goods below cost, and trusted to the quantity sold for the profit In other words, they are always complaining that they sell at a loss. Some folks' idea of a loss is to the effect that they ought to get 50 per cent. on the turnover, and that if they only get 40, they lose 10 per cent. Any attempt to force the price of mantles will simply lead gas companies to make their own. No concern makes a profit out of mantle maintenance, and that department will not stand any extra burden.

New Methods and Appliances.

FEEDER FOR BOILER GRAPHITE.—In the monthly bulletin of The Joseph Dixon Crucible Company (Jersey City, N. J.), this wrinkle is shown. It is attached to the suction line of the boiler-feed pump on one side, and the other is connected to the boiler-feed line or pressure side. The boiler compound and the graphite are mixed in a pail and poured into the funnel after first draining the tank. To fill, pour the liquid into the funnel, venting the tank by the ¼-inch line. When full, close the vent and the filling valve, crack the discharge valve to the pump suction line, and open the valve in the line connected to the boiler-feed line filling the tank, which being under pressure, will discharge to the suction line as fast as wanted. By feeding through the suction the graphite goes through the pump, greatly reducing the maintenance cost thereof. The discharge can be regulated to make the charge last all day or to empty the feeder in a few minutes.

THE MELTING POINT OF COAL ASH.—(*Gas und Wasserfachmänner in Oesterr, Ung.*, October 15, 1913.)—To determine the fusing point of ash, equilateral pyramids, obtained by making a paste, moulding and drying, were heated in a tube in an electric furnace. The decrepitation, intumescing, and fusion of the pyramids, and the temperature of fusion, can be optically observed, as the tube, closed at one end, has the properties of an absolutely black body. It appears that: (1) The percentage of ash in a coal has no influence on the melting point of the ash; (2) the melting-point is a characteristic of the coal seam; (3) the melting-point of ash is in general not affected by coking or the temperature of coking. The investigations gave melting-points ranging from 1,150° to 1,700° C. (2,100° to 3,090° F.), and the author classifies coal ash into the following groups: (1) readily fusible—below 1,200° C.; (2) fusible—between 1,200° C. and 1,350° C.; (3) difficultly fusible—between 1,350° C. and 1,500° C.; (4) very difficultly fusible—between 1,500° C. and 1,650° C.; and (5) refractory—above 1,650° C. Chemical analysis shows that lime, iron and sulphur (pyrites) lower the melting-point, while alumina raises it. Therefore, if an ash is found too readily fusible, the addition of alumina or clay, or the admixture with another coal having a difficultly fusible ash, should give an ash having the required fusing-point. It is shown that it is also necessary to pay greater attention to the quantity of slate in the coal; for, although slate is generally refractory, it becomes the core of large lumps of clinker which interfere with the working of the furnaces. With regard to the uses of coal, the following limits for the melting-point of the ash are named: Coke for central heating plant, above 1,300° C.; anthracite for central heating plant, above 1,400° C.; boiler coal, above 1,400° C.; locomotive and producer coal, above 1,500° C., for fluxing at about 1,200° C. Gas coal should have ash with a fusing-point not below 1,300° C., and should be as free as possible from pyrites and slate. The author holds that the determination of the melting point of the ash will become an important criterion, like the determination of volatile matter and of the percentage in ash, in the valuation of coals, especially gas coals.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,089,172. Gas Stove. F. Will and H. Becker, Rochester, N. Y., assignors to Sill Stove Works, same place.

1,089,204. Gas Burner and Water Heater. J. A. Frisk, Urbana, Ill.

1,089,390. Gas Analysis Apparatus. E. J. Billings, Boston, Mass., assignor to A. D. Little, Incorporated, same place.

1,089,393. Gas Meter. H. Chrisman, Edgewood Park, Pa., assignor to Pittsburgh Meter Co.

1,089,422. Gas Stove. H. C. Maul, Detroit, Mich., assignor to The Michigan Stove Co., same place.

1,089,440. Gas Lamp. F. V. Risinger, Youngstown, O., assignor to The Block Light Co., same place.

Items of Interest
FROM VARIOUS LOCALITIES.

MR. A. W. YOUNG, hitherto Superintendent of the Knoxville (Tenn.) Gas Company, has succeeded Mr. Robert H. Choate as General Manager, the latter having been appointed General Manager of the Spokane (Wash.) plant.

THE hearing that has been going on before the First District division, the New York Public Service Commission, which had and has to do with the price charged for gas by the Brooklyn Union Gas Company, in its Woodhaven (N. Y.) district, will be resumed the first prox. Meantime Commissioner Maltbie has voiced his desire to have the scope of the investigation enlarged, so as to include the rates charged for gas in the districts of Richmond Hill and Jamaica. Meanwhile we are inclined to the view that Commissioner Maltbie takes a decidedly odd step in connection with this new phase of the Queens County gas investigation. Is he to be both complainant and Judge?

DURING the year ending December 31, 1913, the Brooklyn Borough (N. Y.) Gas Company sent out 318,505,700 cubic feet, or an increase af 45,252,700 cubic feet over the previous year. The meters in use January 1, 1914, numbered 10,343, representing an increase of 1,401; the main system was increased by the placing of 6½ miles of pipe; and the net profit for the year (deduction on all matters having been made) was $50,380—an increase of $11,395 over 1912.

"S.," WRITING under recent date, forwards the following from Lebanon, Pa.: "The banquet, held not long ago, in the Hotel Weimar, to properly celebrate the fifth anniversary of the Progress Club—an organization representing the working force of the Lebanon (Pa.) Gas and Fuel Company—was properly done. The feast was served in an especially screened-off section of the Hotel Weimar; and when I say that all the details were under the personal direction of Mine Host, W. S. Grenoble, enough has been said to show that everything was as it should have been. Mr. A. G. Reizenstein, a Director in the Company, who occupied the Toastmaster's seat, paid a fine tribute to the Club, as to its management and as to its results, the greater part of the usefulness of the latter being the closer knitting together of the welfare of the employees of advancing the interests of the Company. Mr. Bleistein, President of the Club, having welcomed the members and their guests in hearty speech, also regretted the enforced absence of Mr. John H. Keppelman, General Manager, the Consumers' Gas Company, Reading, Pa., and of Mr. H. G. Peck, General Manager of the Gas Appliance Sales' Company. Both had signified their intention of taking active part in the Club's re-union. Mayor Longenecker, in responding to the toast 'Our City,' gave the Company and its men to know that they were doing good work in boosting the fair trading of Lebanon. General Manager, George S. Speaker, in a clever speech, congratulated the Club men on their loyalty and fealty to the Company, and on the true spirit of comradeship that actuated them. Messrs. Philip Light, Henry O. Lobell, and Andrew Valentine, also spoke to the point; as did Councilman George F. Krause, Frank P. Hammar, Secretary, the Lebanon Board of Trade; H. P. Fancher, the Company's Commercial Manager, and Solicitor Frank Kouhoupt. The speeches were diversified with some excellent music, both instrumental and vocal. The instrumental section was led by the Lebanon Plectrum Sextette. And the solos of Edmond James contributed much to the enjoyment of the auditors. Miniature gas arc lamps were distributed as favors. The occasion was surely a most happy one."

"THE employees and guests of the Port Chester (N. Y.) District, the Westchester Lighting Company, about 35 in number, assembled in Lawrence's Inn, Mamaroneck, N. Y., the evening of Saturday the 14th, and there shared in a dinner, of the sort which have made fame and gain for Proprietor Asa Lawrence. The toastmaster was Mr. J. P. Kane, who was up to his task every minute. The first speaker was Mr. W. L. Bruce, Claim Agent to Company, the burden of whose well-chosen remarks was mainly concerned with the harmonious and useful results consequent upon the unity of the relations that existed between the heads of the Company and the men. In fact, he declared 'In times of trouble in one department, the others were always eager and glad to co-operate and help out, no matter what the situation might be.' Mr. Andrew Bell, Supt., the Port Chester Fire Alarm System, entertained by narrating some reminiscences of the pleasant

relations that have existed between him and the Company's employees for several years. He further stated that his connection with the electrical contracting business enabled him to appreciate the promptness with which new consumers were supplied with electrical currents for use in all ways, and acknowledged the courteous treatment that invariably went with such service. Mr. Chas. Ross, foreman of the gas division, and Mr. N. H. Manning, foreman, the elec.rical division, took spirited part in the speechmaking, as did Messrs. J. K. Crowell and J. H. Hennessy. The committee in charge of this most successful function comprised Messrs. J. H. Hennessy (Chairman), J. P. Kane, Charles Ross and N. H. Manning.—V."

WE understand that the annual meeting of the staff forces of the American Gas Company, which was brought off this year in Philadelphia, the third week of this month, was not only well attended but was much more than ordinarily successful, judged from the routine. We regret we are unable to say more about it; but the sessions are conducted in the nature of caucus proceedings, in that no report for general publication is permitted.

THE residents of the Burbank (Cal.) District (the home settlement of the inducer of great and freaky vegetation) are declaring that their homes are incomplete, in that gas is not obtainable. However, the Burbank Improvement Club declares that, if the mains from the San Jose gas district are not put through the streets of Burbank, the Club will favor the construction of a separate plant.

THE demonstration cooking lectures and exemplifications given this month by the Savannah (Ga.) Gas Company, were wonderfully well attended, and the demonstrations were really high class. The plan of the Company, in this respect, is to give special demonstration lectures on the ninth and tenth of each month, the appliance show at headquarters meantime being a continuous one.

"BAYARD," writing from Olympia, Wash., under date of the 20th inst., encloses this: Engineer F. S. Burroughs, of the Washington Public Service Commission, has concluded an examination that had for its object the valuing of the North Yakima gas works of the Pacific Power and Light Company. The task was undertaken with a view to getting together data on which to base a new rate schedule. The complaints before the Board, in the instance of current gas rates, will be taken up early in April, and will be considered in connection with the hearings held for determining an equitable schedule of electric current rates. Engineer Burroughs places the original cost of the gas plant, including a proportionate share of the cost of the Portland and North Yakima offices of the Pacific Power and Light plants, at $219,715, the cost of reproduction at $234,093, and the current (or depreciated) value at $201,718. Net earnings in the years 1911 and 1912 were, respectively, $9,939 and $9,897; and for the past 6 months of 1913, the net equaled $5,338. At the net thus returned the sums in hand indicate a return of something less than 5 per cent. on the investment.

MR. J. H. WHEELWRIGHT, President of the Consolidation Coal Company, and of the Fairmont Gas Company as well, accompanied by a number of guests, enjoyed a most entertaining and instructive journey of inspection over and through the industrial fields in and about Fairmont and Clarksburg, West Va. The party left Cumberland the morning of the 20th inst., and returned the following Sunday evening. The leading properties visited were these: Fairmont Gas Company, Monongahela Traction Company, and some of the mines of the Consolidation Coal Company.

MANAGER J. W. GOLDEN, of the Savannah Gas Company, is inclined to the view that the construction of the proposed elevated railroad from the tracks of the Central Georgia Railroad, to the Company's plant foot of East Broad street, will not be gone on with this year. The delay is occasioned by the possibility that it may in the near future be found profitable to construct a coal gas plant, complete. In that event, of course, the elevated structure will be built.

A CORRESPONDENT in Tampa, Fla., writing under date of the 20th inst., thus informs us: "At a meeting of the Tampa Gas Employees' Association, held the evening of the 18th inst., Manager Roscoe Nettles certainly astonished the Club members by presenting to each white employee a life insurance policy, the face of which is equal to the amount of the annual salary or wage of the worker; the Company to pay the premium each recurring year. About 60 policies were written in the Equitable Company, through its local representative, Mr. N. W. Hensley. The plan originated with Manager Nettles, and his project met with positive, instant approval of his superiors. There were present at the time the policies were presented, besides Mr. Nettles and assistants, Mayor McKay and several other city officials. The Mayor delivered a very appropriate address, by invitation, in the course of which he remarked that the men should think well over that which could be accomplished by concentration and cooperation, pointing out that he who devoted some of his leisure moments to planning out how he could better accomplish his daily tasks, was sure to succeed, no matter what his vocation. He paid a round compliment to the Company, on account of its generous action in making sensible future provision for the families of the men, and declared that intelligent co-operation, brisk work and loyal support from all branches of the business had put the Company in excellent relations with the public. Manager Nettles made a short address, in which he thanked the men for their loyal co-operation, and ascribed his success since assuming the duties of Manager to the faithfulness of the men in the performance of their work."

RECENT advices from Oswego, N. Y., are to the effect that, under the action of Mr. Roy F. Whitney, Manager of the Oswego Gas and Electric Company, the Company has filed with the Secretary of State a petition for the right to increase its capital stock in the sum of $400,000. The increase had been assented to by the Directors and had been authorized by the Public Service Commission. The $400,000 stock is to be held in the treasury and issued between December 1, 1915, and December 1, 1925, the proceeds to be used in retiring such of the Company's 5 per cent. bonds as may be desired after December 1, 1925. The Company proposes to virtually reconstruct its generating and purifying systems, and to extend its main system by placing not less than 6 miles of pipe. The betterments on the electrical division include extensions to the overhead lines, additional generating apparatus and switchboard equipment.

"C. W. B.," writing from Binghamton, N. Y., under date of the 24th March, says: "On Friday evening, the 20th inst., the employees of the Binghamton Gas Works met in the office of the Company, 40 Chenango street, to organize the Binghamton Gas Company Progressive Association. Its objects are to promote the interests of the employees and of the Company, through educational and social means. The officers elected were: President, A. L. La Baron; Vice-President, George O'Neil; Secretary, E. J. Gattry. After the organization was perfected, the balance of the evening was spent discussing the gas arc."

ADVICES from Philadelphia, under date of the 22d inst., are to the effect that, at the inspiration of Director Cooke, the Philadelphia Department of Public Works, an ordinance has been sent to Councils, authorizing the establishment of a contract between the city and the U. G. I. Company for the maintenance of mantle gas lamps, to replace certain gasoline lamps heretofore used to illuminate the streets in specified districts. The ordinance provides that the city is not to pay in excess of $26 per lamp per annum, the service to be based on the city's 3,860-hour yearly schedule, illuminating table. The rate charged for this service now (that is, gasoline), is $29 per lamp per annum.

A MUCH needed reorganization has been perfected in respect of the operating of the Medford (N. J) Gas Company. Mr. John A. Lamb has been appointed Superintendent, and the Trustees have agreed that hereafter the public lamps shall be maintained on an every and all-night basis.

AT a meeting of the City Council, Bryan, Texas, the time limit within which to commence work, as specified by Messrs. Merritt & Gamnille, under the gas franchise granted them last fall, was extended for 60 days.

THE Tom's River plant of the Ocean County (N. J.) Gas Company, is to be doubled as to its generating and purifying apparatus. It is proposed that the capacity of the works will be increased to a daily production of 300,000 cubic feet. The work will be done under the immediate direction of Mr. N. S. McClarney, Superintendent.

LAST week, Senator Reed and Representative Borland, both residents of Kansas City, Mo., urged upon the House of Representative Inter-State Commerce Committee a bill putting inter-State gas mains under control of the inter-State Commerce Commission, on the ground that said mains are in reality common carriers. Mr. Borland declared that not only Kansas City, but every other city in the southwestern petroleum and gas belt was deeply concerned in the proposed legislation.

Utilities Commission News.

EXTENDS LIMITS OF INQUIRY.—Public Service Commissioner Maltbie, First District of New York, announces that he will recommend to his associates on the Commission that an investigation be started into the advisability of ordering an 80-cent gas rate in Jamaica and Richmond Hill (Borough of Queens, New York city).

This unusual action by a member of the Commission instead of an angry taxpayer, as is usually the case, followed developments at the hearing in the fight being made by the residents of Woodhaven for the cheaper rate. Robert P. Beyer, Counsel for the Woodhaven residents, who are making the fight, announced that he would take charge of the broader fight for a flat cheap gas rate throughout the entire Fourth Ward of Queens.

HAD NO PERMISSION.—The Idaho Public Utilities Commission found that the Beaver River Power Company had not obtained from the Commission a certificate of public convenience and necessity covering the sale of energy for light and power purposes in the city of Pocatello. It had commenced construction of a distribution system under a franchise granted by the city, but this was found by the Commission to be in contravention of the State laws, and the Company was ordered to immediately discontinue construction until further ordered.

ELKHART RATE TO BE REVIEWED.—The authorities of Elkhart (Ind.) have been in conference with Chairman Duncan of the State Commission relative to rates for gas and electricity, and the service in that city. While the Commission will not likely be able to reach the case before June next, it promised its assistance in valuing the properties and other work in connection with the questions at issue.

COMPLAINT OF LOCKPORT (N. Y.) GAS.—Mayor Brock recently made complaint to the Public Service Commission against the quality and quantity of the gas supply of the Lockport Light, Heat & Power Company. The action follows the second recent experience of consumers here when the gas in factories, stores and homes reached a low point of efficiency.

In a lengthy letter the Mayor set forth a number of specific charges against the Company and asks that an inspector be sent to investigate.

MUST EQUALIZE ITS GAS RATES.—The Railroad Commission of California has issued an order, in which it finds that the Western States Gas and Electric Company has been discriminating among its patrons in the vicinity of Lodi, San Joaquin county, affording to some rates lower than those on file with the Commission.

In its order the Commission directs that the Company cease its discrimination and put into effect a new rate for agricultural service. The Commission states further that if this new rate is not as low as the lowest rate now being given to those patrons in whose favor it has been discriminating, the Commission will institute an investigation into all of the rates, regulations and practices of the Company, and that this investigation will also include a consideration of the "conduct of the Company in departing from the legally established rates and schedule."

MAY NOT CAPITALIZE REPLACEMENTS.—The Gas and Electric Light Commission, of Massachusetts, has authorized the Leominster Gas Light Company to issue 850 shares of additional capital stock of $100 par value for the payment of floating debt incurred in plant additions. The Company petitioned to issue 1,250 shares, but the Board refused 400 shares on the ground that "not less than $30,000 of the expenditures which were the basis of the debt on December 31, 1913, represented the cost of property substituted for other property which had been abandoned, rather than actual additions." "Such expenditure," says the Board, "is in fact a provision against extraordinary depreciation and essentially a replacement of plant. The cost of such work is a proper charge upon income and should not be represented in additional stock."

The Market FOR GAS SECURITIES.

Another week of indecision respecting the Mexican situation, together with the necessary curtailing of operations by the banks, until the general financial world shall have become better acquainted with the new system of expanded finance, contributed to make a dull week in operations on stocks on any and all accounts.

Consolidated managed to break 133, the bid rate for it this morning (Friday) being 132¾. Holders offered the shares at 133, and some business was reported at the last named figures. Of course, there is no good reason for the decline; in fact, as before and for many months, there is every reason for positive advance, if actual business conditions were the sole or determining factor. The demand for city gas bonds continues. A significant instance in respect of the bond market is shown by a sale, yesterday, on the Exchange, of $5,000, New York, Gas, Electric Light, Heat and Power 5's, at 104¾. This is a gain of 3 points in the selling price as of 6 months.

Brooklyn Union is managing to keep close to recent or mid-winter quotations for it. The figures to-day are 126¾ to 127½. Peoples, of Chicago, is steady. There were $5,000 of Peoples consoliated 5's sold on the Exchange at 114½; and another noteworthy sale was $1,000 California Gas and Electric 5's, at 94—our last recorded sale in this security is $2,000 at 91½.

Lacledes are dull and weaker, without any tangible reason therefor. The regular quarterly of 1¾ on Cincinnati Gas and Electric is payable next Wednesday. The earnings of the Pacific Gas and Electric for 1913, show these figures: Gross, $16,202,237; operation, including expenses, maintenance, taxes, etc., $9,331,206; net, $6,871,031; annual interest on outstanding bonds, $3,892,920; interest on notes, $250,000, and a balance of $2,728,211. For 1913 the Los Angeles Gas and Electric Company reports a net operating revenue of $1,141,377. The general outlook is favorable, if one may judge from the great number of inquiries being received by gas works builders.

GAS STOCKS.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

MARCH 30.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$90,816,500	100	132¾	133
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	8,500,000	1,000	101	103
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	101	104
Mutual Gas Co.	8,500,000	100	157	157
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	99	101
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	59	61
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	99½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	108
Con. 5's, due 1945, J. & J.	1,500,000	—	98	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	103	104
Preferred	5,000,000	100	93	94
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	91	9
The Brooklyn Union	15,000,000	1,000	126½	127½
1st Con. 5's, due 1948, M. & N.	15,000,000	—	103	103
Yonkers	999,650	500	180	—
Out-of-Town Companies.				
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Consolidated, Baltimore	13,460,084		118¾	119
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,000	—		—
Con. Gas Co., Baltimore City, 4½	2,751,000	—		—
Essex and Hudson Gas Co.	6,500,000	—	133	136
Hartford	750,000	25	190	200
Laclede Gas Co., St. Louis.	10,000,000	100	96	98
Preferred	2,500,000	100	—	102½
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	130	130
Massachusetts Gas Companies, of Boston	25,000,000	100	90¾	91½
Preferred	25,000,000	100	—	95
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	123¾	123¾
1st Mortgage	20,100,000	1,000	103	103½
2d "	2,500,000	1,000	104	—
Pacific Gas and Electric Co.	15,500,000	—	45½	45½
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	116	—
Consolidated 5's	2,000,000	—	104¾	105½
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
United Gas Imp. Co.	55,502,960	50	170	71
Washington (D. C.) Gas Co.	1,600,000	200	440	442
Western Gas Co., Milwaukee	4,000,000	—	—	—

FINANCIAL NOTICES.

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, Mar. 11, 1914.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15, 1914, to stockholders of record at the close of business, March 31, 1914. Checks will be mailed.

2033-5 LEWIS LILLIE, Treasurer.

Wanted, GAS BONDS of new companies with small issues. We make a specialty of gas bonds and can handle bonds or stock of new companies that are conservatively bonded.

Address, R. TAYLOR,

9034-2 Union Building, Newark, N. J.